

THE NEW INTERNATIONAL ENCYCLOPÆDIA

SECOND EDITION

VOLUME XVIII

NEW YORK
DODD, MEAD AND COMPANY

1918

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THE UNIVERSITY PRESS, CAMBRIDGE, U S A.

BOSTON BOOKBINDING CO., CAMBRIDGE, U S A.

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KEY TO PRONUNCIATION

For a full explanation of the various sounds indicated, see the KEY TO PRONUNCIATION in Vol. I.

ā as in ale, fate.
ā " " senate, chaotic.
ā " " glare, care, and as *e* in there.
ā " " am, at.
ā " " arm, father.
ā " " ant, and final *a* in America, armada, etc.
α " " final, regal, pleasant.
α " " all, fall.
ē " " eve.
ē " " elate, evade.
ē " " end, pet.
ē " " fern, her, and as *i* in sir, etc.
e " " agency, judgment.
i " " ice, quiet.
i " " quiescent
i " " ill, fit
ō " " old, sober.
ō " " obey, sobriety.
ō " " orb, nor.
ō " " odd, forest, not.
o " " atom, carol.
oi " " oil, boil.
ōō " " food, fool, and as *u* in rude, rule.
ou " " house, mouse.
ū " " use, mule.
ū " " unite.
ū " " cut, but.
u " " full, put, or as *oo* in foot, book.
ū " " urn, burn
y " " yet, yield
B " " Spanish Habana, Córdoba, where it is like English *v* but made with the lips alone.

ch as in chair, cheese.
D " " Spanish Almodovar, pulgada, where it is nearly like *th* in English then.
g " " go, get.
G " " German Landtag = *ch* in Ger. ach, etc.
H " " *j* in Spanish Jijona, *g* in Spanish gila; like English *h* in hue, but stronger.
hw " " *wh* in which.
K " " *ch* in German ich, Albrecht = *g* in German Arensburg, Mecklenburg, etc.
n " " in sinker, longer.
ng " " sing, long.
N " " French bon, Bourbon, and *m* in the French Étampes; here it indicates nasalizing of the preceding vowel.
sh " " shine, shut.
th " " thrust, thin.
TH " " then, this.
zh " " *z* in azure, and *s* in pleasure.

An apostrophe [*'*] is sometimes used as in *tā'b'l* (table), *kāz'm* (chasm), to indicate the elision of a vowel or its reduction to a mere murmur.

For foreign sounds, the nearest English equivalent is generally used. In any case where a special symbol, as *G*, *H*, *K*, *N*, is used, those unfamiliar with the foreign sound indicated may substitute the English sound ordinarily indicated by the letter. For a full description of all such sounds, see the article on PRONUNCIATION.

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THE NEW INTERNATIONAL ENCYCLOPÆDIA

PANJABI (pūn-jī'bh) **LANGUAGE AND LITERATURE.** The modern Indian language and literature of the Punjab (q.v.). The Panjabi represents, roughly speaking, an archaic dialect of Hindi, supplemented by a large number of loan words from Arabic and Persian, and belongs to the central group of the Indo-Aryan languages. On the other hand, the infusion of Sanskrit loan words (technically called *tatsama*, identical) is small, as compared with the Eastern languages of India, especially Bengali (q.v.) and Uriya (q.v.). Panjabi, like all the Indian languages, has many small sub-dialects, which shade off into each other. The chief of these dialects are Multani in the South, which stands intermediate between Panjabi and Sindhi (q.v.), Jathki in the Centre, and Chibhali-Dogri in the North. There are several alphabets. Of these the oldest is the Gurmukhi, a modification of the Sanskrit Devanagari alphabet (q.v.), with the omission of a few signs. It is in the Gurmukhi script that the Adi-Granth (q.v.) of the Sikhs is written. Next to the Gurmukhi the Lundi, which is employed by the merchant class, deserves mention. The official character of the government, however, is the Arabic, which is the one most generally employed. Panjabi has practically no literature, excepting the Sikh Granths, although the New Testament and parts of the Old Testament have been translated into Multani and Dogri.

Bibliography. Newton and Janvier, *Dictionary of the Panjabi Language* (Lodiana, 1854); Beames, *Comparative Grammar of the Modern Aryan Languages of India* (London, 1872-89); O'Brien, *Glossary of the Multani Language* (Lahore, 1881); Tisdall, *Panjabi Grammar and Reading Book* (London, 1889); Bhai Maya Singh, *The Panjabi Dictionary* (Lahore, 1895); Newton, *Panjābī Grammar* (Ludhiana, 1898); Wilson, *Grammar and Dictionary of Western Panjabi* (Lahore, 1899); Jukes, *Dictionary of the Jathki or Western Panjabi Language* (ib., 1900); O'Brien, *Glossary of the Multani Language or Southwestern Panjabi*, revised by Wilson and Kaul (ib., 1903); Bailey, *Panjābī Grammar as Spoken in the Wazirabad District* (ib., 1904). For a detailed study of the language, consult Sir G. E. Grierson, *Linguistic Survey of India: Western Hindi and Panjābī*, vol. ix, part i (Calcutta, 1908).

PANJAN'DRUM, THE GRAND. An imagi-

nary person in a jumble of nonsense made up by Samuel Foote to test the remarkable memory of Macklin the actor.

PANJIM, pan-zhēn', or NEW GOA. The capital of the Portuguese possession of Goa (q.v.) in India (Map India, B 6).

PANKHURST, CHRISTABEL. See PANKHURST, EMMELINE.

PANK'HURST, EMMELINE (*née* GOULDEN) (1858-). The leader of the militant wing of the English suffrage movement, whose long crusade assures her a permanent place in the social and political history of her time. She was born in Manchester of parents who were advocates of woman suffrage and champions of freedom for the slaves during the American Civil War. Her education she received at private schools in England and at the Ecole Normale in Paris, where she was a roommate of Noémie, the daughter of Henri Rochefort. In 1879 she married Dr. Richard Marsden Pankhurst (died 1898), who was devoted to work for social reform. Five children were born to them. In 1889 Mrs Pankhurst, with her husband, helped to found the Women's Franchise League. Her connection with this and other societies, her work as a Manchester Poor Law Guardian (1874-98), as Registrar of Births (1898-1900), and on the Manchester School Board, gave her valuable practical experience. In 1903 the Women's Social and Political Union was founded at a meeting called by Mrs. Pankhurst and held at her Manchester home. This organization, the headquarters of which was later established in London, whither Mrs Pankhurst moved, had a single aim—the attainment of political equality of women with men. It was destined to become potent and formidable, receiving large contributions (at one meeting, £10,000, at another, £16,000), and employing a salaried staff of more than 100. Mr. and Mrs. F. W. Pethick Lawrence (q.v.) were for some years ardent supporters of the Union.

About 1905 Mrs. Pankhurst and her followers were persuaded that more aggressive methods were necessary. The tactics of "peaceful militancy," pursued for some five years, included recourse to the time-honored custom of heckling public speakers, especially cabinet ministers; the opposing of candidates at by-elections; gigantic processions; deputations and petitions to Parliament, to the Prime Minister, and others; and an ingeniously varied miscellany of sensational

propagandist activities carried on by methods that frequently resulted in disturbances of the peace and brought many women to jail. The fate of the suffrage bills introduced into Parliament up to 1912 was taken by Mrs. Pankhurst and the Women's Social and Political Union as proof that the government had deliberately and repeatedly tricked and betrayed their cause. Although pledges from a majority of members of Parliament to support equal suffrage had been secured, the cabinet was hostile. There resulted a decision to inaugurate a "women's revolution." The suffragette incitements to violence had their effect. Country houses, club-houses, railway stations, lumber yards, grand stands, and churches were fired; race courses and golf links damaged, letters in the pillar boxes destroyed by acid, and bombs exploded. Offenses from window smashing to arson became so common as to bring some thousand women to jail in 1913. In February of that year, Mr. Lloyd-George's country house at Walton having been badly damaged by a bomb, Mrs. Pankhurst was held responsible for the act of her supposed associates. She was tried for inciting to felony and, sentenced to three years' imprisonment, was sent to Holloway Jail. The imprisonment of Mrs. Pankhurst inflamed the suffragettes, because they regarded her as simply a political offender and loudly proclaimed her prosecution a cowardly procedure in face of the fact that Bonar Law and Sir Edward Carson, who publicly incited to violence in Ulster, remained at large and unmolested. Mrs. Pankhurst resorted to the "hunger strike," proclaiming that she would die if necessary, but after a few days she was released in accordance with the provisions of the "Cat and-Mouse" Act, only to be imprisoned again and again. A year from the time of her conviction she had served but three weeks of her sentence. In the summer of 1913 she contrived to visit her daughter Christabel in Paris, whence she sailed for an American lecture tour. This was her third visit to the United States, the two former visits having been in 1909 and in 1910-11. On her arrival in New York on Oct. 26, 1913, she was detained for two days by the immigration authorities at Ellis Island as an "undesirable alien," but she was released by orders from Washington and received a triumphant welcome. Again after her return to England about two months later she was frequently in prison. In the summer of 1914 Mrs. Pankhurst and her associates announced a cessation of militant tactics until the European War should end.

Mrs. Pankhurst's daughters, CHRISTABEL (1880-) and E. SYLVIA (1882-), women of exceptional capacity and energy, took part in their mother's suffrage activity from childhood on. Christabel was educated at the Manchester High School for Girls and at Victoria University, Manchester. In 1906 she took her LL.B. degree with honors, but on the score of her sex was refused at Lincoln's Inn, whence she wished to be called to the bar. It was she who in 1905 really initiated the policy of militancy, and she was three times imprisoned. After 1912 she made her home in Paris, whither she had fled to escape arrest on a conspiracy charge, and where she edited the *Suffragette*, the weekly organ of the Women's Social and Political Union. From October, 1914, to March, 1915, she lectured in the United States. Her *Plain Facts about a Great Evil* (the social evil), which also

appeared with some changes as *The Great Scourge and how to End it*, was published in 1913.

Sylvia Pankhurst, educated in the Manchester schools and at the Royal College of Art, South Kensington, where she won a scholarship, devoted herself to the militant side of the votes-for-women campaign and shared the prison and many other experiences of her mother and sister. In 1911 she lectured in the United States and in the same year appeared her volume *The Suffragette* (New York), which carefully records the "peaceful militancy" of 1905 to 1910. Consult this book; also A. G. Gardiner, *Prophets, Priests, and Kings* (London, 1908, new ed., in "Wayfarer's Library," ib., 1914); Emmeline Pankhurst, *My Own Story* (New York, 1914). See WOMAN SUFFRAGE.

PANKHURST, SYLVIA. See PANKHURST, EMMELINE.

PANKOK, pän'kók, BERNARD (1872-). A German architect, designer, and painter. He was born at Munster (Westphalia) and studied at the academies of Düsseldorf and Berlin. In 1902 he was appointed director of the Royal School of Decorative Arts at Stuttgart. A man of varied activities, Pankok is perhaps best known through his illustrations for the *Jugend*, for *Pan*, and for the *Catalogue of the German Exhibit* at Paris in 1900. As an architect he erected the marriage-contract hall in Dresden, the room for modern paintings in the Stuttgart Gallery, and rooms at various expositions. As a painter he is represented in the galleries at Berlin, Stuttgart, and Schwerin. In the development of modern decorative art in Germany he played an important part.

P'AN-KU, pän'kōō. A mythical being, invented by the later compilers of Chinese legends, said to have been the first development of conscious being out of chaos and the originator of the human race. The original historians say nothing about P'an-ku, but the Chinese names given him in popular speech and in the voluminous mediæval literature seem to mean Embryo, Prince of the Three Powers (of heaven, earth, and man), Son of Heaven, etc. The legends of this reputed first conscious being are greatly embellished, according to the fancy of myth-making writers. After toiling millions of years to bring the earth into shape, he died, and his breath became wind and cloud, his voice thunder, his left eye the sun, his right eye the moon, his teeth and bones metals, his marrow pearls and precious stones, his sweat rain, and the parasites on his body, impregnated by the wind, the human species.

PAN MICHAEL. A novel by Henryk Sienkiewicz (1887). With the novels "With Fire and Sword" and "The Deluge," it completes the great trilogy on the Polish wars of the seventeenth century.

PANMUHOREE. See FENNEL.

PANNA, or **PUNNAH**, pän'ä. A native state of the Bundelkhand (q.v.) Agency, Central India. Area, 2492 square miles. Pop., 193,000. Capital, Panna, pop., about 12,000.

PANNINI, pän-né'né, GIOVANNI PAOLO (c.1695-1768). An Italian architectural painter of the Roman school, born at Piacenza. He was the pupil of Benedetto Luti and Andrea Lucatelli in Rome, and was influenced by Salvator Rosa. He confined himself to interiors and exteriors of buildings, ruins, and monuments in or about Rome and introduced picturesquely arranged

figures and accessories. Grace and dexterity of design, fantastic richness of composition, and masterly rendering of atmosphere distinguish all his works, which include: "Interior of St. Peter's" and "Antique Ruins," in the Louvre; "The Pyramid of Cestius," in the National Gallery, London; "Cardinal Polignac Visiting the Interior of St. Peter's," in the Metropolitan Museum, New York; "The Reception of Benedict XIV.," in the Naples Museum, and many other fine examples in the galleries of Rome, Florence, Naples, Madrid, and Vienna and in private collections in England. He also painted frescoes in the Quirinal and other Roman palaces and villas and was president of the Academy of St. Luca and member of the French Academy. His works have been frequently engraved.

PANNONIA. A province of the ancient Roman Empire, bounded on the north and the east by the Danube and on the west by the mountains of Noricum, and on the south reaching a little way across the Save and thus including part of modern Hungary, Slavonia, and parts of Bosnia, Croatia, Carniola, Styria, and Lower Austria (Map Rome, D 2). It received its name from the Pannonians, a race of doubtful origin, who at first dwelt between the Dalmatian Mountains and the Save, in modern Bosnia, and afterward more to the southeast in Mesia. The Roman arms were first turned against them and their neighbors, the Iapydes, by Augustus in 35 B.C., and after the conquest of Segestica or Siscia (Siszek) he subdued them. An insurrection took place in 12 B.C., which Tiberius crushed after a long struggle. A more formidable insurrection of the Dalmatians and Pannonians together, in 6 A.D., was suppressed by Tiberius and Germanicus, after a two years' struggle. Fifteen legions had to be assembled against the Pannonians, who mustered 200,000 warriors. Hereupon the Pannonians settled in the more northern districts, which received their name, and of which the former inhabitants, the Celtic Boii, had been in great part destroyed in Caesar's time. The country was now formed into a Roman province, which was secured against the incursions of the Marcomanni and the Quadi by the Danube and on its other frontiers had a line of fortresses. Military roads were constructed by the conquerors, who also planted in the country many colonies and municipia and thus gave it a rough coating of civilization. The country was divided by Trajan, during the Dacian wars, into Upper (or western) and Lower (or eastern) Pannonia. Under Galerius and Constantine it underwent other changes. Upper Pannonia was the scene of the Marcomannic War in the second century. In the fifth century Pannonia was transferred from the Western to the Eastern Empire and afterward given up to the Huns. After Attila's death, in 453, the Ostrogoths obtained possession of it. The Lombards under Alboin made themselves masters of it in 527 and relinquished it to the Avari upon commencing their expedition to Italy. Slavic tribes also settled in the south. Charlemagne brought it under his sceptre. In the reigns of his successors the Slavs spread northward, and the country became a part of the great Moravian Kingdom, till the Magyars or Hungarians took it in the end of the ninth century. In the time of the Romans the chief towns of Upper Pannonia were Carnuntum (Petronell), Petovio (Pettau), Siscia (Siszek), Emona (Laibach), Savaria (Stein and Anger), and Vindobona (Vienna); of Lower

Pannonia, Aquineum (Alt-Ofen, or Old Buda) and Sirmium (Mitrovic). Consult the article "Pannonia," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

PAN'NUS. See CONJUNCTIVITIS.

PANO, pñ'nò. A tribe of the Huallaga and Ucayali rivers, northeastern Peru, the nucleus of those constituting the Panoan stock (q.v.). According to their traditions they have emigrated from a northern region. In 1670 the missionary Lucero collected a part of them into a settlement at the mouth of the Huallaga. In 1830 they removed to the mission of Sarayacu on the Ucayali, where they still reside. They are expert boatmen, building canoes of 40 feet in length, and they have a frank, easy, and courteous bearing, but are much given to drunkenness. It is said that they formerly preserved pictograph records painted on paper manufactured from the fibre of banana leaves. They number less than 2000. Consult M. Raoul de la Grasserie, in *Compte-Rendu du Congrès des Américanistes de Paris* (Paris, 1888).

PANOAN (pñ'nò-in) **STOCK.** An important South American linguistic stock, comprising some 20 tribes occupying the immense forest region on the upper portions of the Madeira, Beni, Parus, Javary, Ucayali, and Huallaga, east of the Andes and south of the Amazon, in Peru, Bolivia, and western Brazil. Although apparently of more than average native intelligence, they are almost all in their original savage condition, some of them being even accused of cannibalism. Several of their tribes are light in color. Like most of the peoples of the Amazon region, they are steadily decreasing in number. Among the most important tribes of the stock are the Cashibo, Conibo (q.v.), Mayoruna, Pano, Remo, Senei, Setebo, and Shipibo. Consult Von den Steinen, *Dictionario Sipibo* (Berlin, 1901), and M. Navarro, *Vocabulario Castellano-Quichua Pano, etc.* (Lima, 1903).

PANÓFKA, pñ-nóf'ku, THEODOR (1801-58). A German archaeologist, born and educated in Breslau. He began the important excavations at Nola, Italy, and at the establishment of the Archaeological Institute at Rome became its secretary. In 1844 he was named professor of archaeology at Berlin. His works, which are still valuable for the material collected and for the illustrations, include: *Neapels antiken* (1828); *Musée Blacas* (1830-33); *Bilder antiken Lebens* (1843).

PANORAMA, pñ'nò-rä'má (Neo-Lat., from Gk. *pās*, *pas*, all + *ōpāa*, *horama*, view, from *ōpāo*, *horan*, to see). A pictorial representation of the whole surrounding landscape as seen from one point. It differs from a painting in that the latter only gives part of the landscape and aims at artistic effects, whereas the chief aim of the panorama is optical illusion. The first step in the construction of a panorama is to obtain sketches of the entire region to be represented; each sketch is a representation of a portion of the landscape in the form of a sector of a circle with the sketcher's position as a centre and the horizon for circumference. The canvas to which the sketches are to be transferred is hung round the sides of a circular room and forms the surface of a cylinder, on the inside of which the panorama is painted. The stage from which the picture is viewed is placed in the centre of the room, about 30 feet on every side from the picture; the picture itself is fastened above to

a strong circular hoop and, hanging down, has its lower edge fastened to a similar hoop, which is heavily weighted to keep the picture steady. The light is admitted by an aperture in the roof, which is concealed by an awning from the spectators on the stage.

The idea of a panorama was first conceived by the architectural painter Breisig, of Danzig, but the first to put it in execution was Robert Barker, a painter, who in 1788 succeeded in producing an effective panoramic view of Edinburgh. This was followed by a view of London and scenes from the Napoleonic wars. In 1799 the panorama was taken up in Paris, where it was much improved, and whence it was introduced into other European cities. Its use has greatly increased since the Franco-Prussian War of 1870-71. By the employment of plastic objects in addition to painting, the painter Philippeaux greatly increased the optical illusion, as was seen in his admirable panorama, "The Siege of Paris," exhibited in 1875. He was also employed in the United States on a panorama of the "Battle of Gettysburg," which was exhibited in New York, 1888-91, and afterward in other American cities. Among painters who have attained distinction in painting panoramas were De Neuville and Detaille in France, Ludwig Braun and Anton von Werner in Germany. In recent years many artists of ability have painted panoramas, which have been frequently exhibited in most of the chief cities of Europe and the United States. Consult Bapst, *Essai sur l'histoire des panoramas et dioramas* (Paris, 1891).

PANORMITA, pā'nōr-mē'tā, ANTONIO BEOCADELLI (1394-1471). An Italian humanist, born at Palermo, whence the name Panormita, by which he is commonly known. He was educated at Siena and taught classics at Pavia, Bologna, and Padua. His best-known work was the collection of obscene elegies entitled *Hermaphroditus*, which, though attacked by some of the lesser clergy and condemned by the Pope, won praise from the scholars of the time for its elegant Latinity. In 1435 Alfonso of Naples pensioned him and made him historiographer.

PANORMUS. The ancient name of Palermo (q.v.).

PANPSYCHISM, pān-sī'kiz'm (from Gk. *πᾶς*, *pas*, all + *ψυχή*, *psyche*, soul). A term employed in the history of philosophy to designate the metaphysical theory that the whole of nature, inanimate and animate alike, is endowed with mind or has a mental side or aspect, so that the atom of the physicist, no less than man himself, though of course in immeasurably less degree, is ensouled, and the movements of the atom, no less than the voluntary movements of man, are accompanied by mental process. The name may be applied in ancient philosophy to the Stoic doctrine of *Allbeseelung*, as opposed to the earlier hylozoism, and in modern times to such philosophical beliefs as were held by Thomas Carlyle, still more to such a philosophical system as that of Fechner. Every pantheistic system (see **PANTHEISM**) is also, in a sense, panpsychistic. In particular, certain of the Arabian philosophers, notably Averroës (q.v.), have been termed panpsychists by the historians of philosophy.

PANSA, pān'zā, HOUSE OF. The name given to the ruins of a large dwelling in Pompeii, from an election notice painted on its front wall. The

house is interesting chiefly on account of the regularity of its plan. Although extensive, it contained few large apartments, but was cut up into small rooms, or groups of rooms, and contained a number of shops, including a bakery. No part of the wall decorations is preserved. Consult Mau-Kelsey, *Pompeii: Its Life and Art* (2d ed., New York, 1902).

PANSLAVISM, pān-slāv'iz'm (from Gk. *πᾶς*, *pas*, all + Ger. *Slave*, Slav, from OChurch Slav. *Slovieninu*, Russ. *Slavyaninu*, Slav). The term applied to a movement which contemplates the political and cultural union of all nations of Slavic descent. It had its origin about 1830 and was fostered by the general awakening of the national spirit which characterized the Europe of that time. The movement throughout central Europe was paralleled by the Slavophile movement in Russia which had for its object the regeneration of the country through a return to the old ideas of Russian civilization as they had stood before the Western innovations of Peter the Great. Russia, owing to its predominant position in European affairs under Nicholas I, came to be regarded as the protector of the scattered Slavic peoples living under Austrian, Prussian, or Turkish rule. In 1848 the leading promoters of Panslavism summoned a congress at Prague, which was attended by Slavs from Bohemia, Moravia, Silesia, Serbia, Croatia, Dalmatia, and Poland. Since 1860 Panslavism has exerted direct influence on Austro-Hungarian politics, both northern and southern Slavs tending towards united action in opposition to the Germans and Magyars. In 1867 a great Slavic congress was held at Moscow, but with little material result. It was largely as the natural champion of the oppressed Slavs of the Balkan Peninsula that Russia declared war on Turkey in 1877, and the politics of the peninsula for a few years were influenced to a considerable degree by the ambitions of the Panslavists. An attempt to revive the Panslavic idea was made in 1908, when a second congress of Slavic nations was held in Prague. The initiative in this case was taken by the Czechs and Poles, but the resolutions of the congress in favor of Slavic unity were not carried out. The two Balkan wars as well as the situation in Austria-Hungary prove that the idea of political Panslavism has no prospects of realization. Though the European War of 1914 is ascribed by many to the aggressiveness of the Panslavists, the latter have played a very insignificant part in it. Whatever there is of Panslavism has asserted itself most effectually in the field of literature and more especially in philology, where the researches of many scholars have resulted in laying down the principles for a comparative science of Slavic languages. Consult: Rudolf Vrba, *Russland und die Panslavismus* (2 vols., Prague, 1913); Louis Levine, *Pan-Slavism and European Politics* (New York, 1914); Ernest Ludwig, *Austria-Hungary and the War* (ib., 1915).

PANSY. See VIOLET.

PANTÆNUS (Lat., from Gk. Πανταίνος, *Pantainos*). Teacher of the Christian catechetical school in Alexandria about 180-195. Little is known about him, but he was probably a native of Sicily, trained in the Stoic and Pythagorean philosophy and converted to Christianity in adult life. He was one of the earliest to use philosophy in Christian teaching. His fame rests chiefly upon his work as a teacher, which is described with affectionate admiration by his cele-

brated pupil Clement. (See CLEMENT OF ALEXANDRIA.) Tradition relates that he went on a mission to India, which is not improbable. He is said to have written commentaries on the Scriptures, but none have survived. It has been suggested that he may have written the last two chapters of the Epistle to Diognetus. There is no trace of him after the persecution under Septimius Severus (203). The small fragments ascribed to Pantænus are given in Migne, vol. v, and Routh's *Reliquiæ Sacræ*, vol. i (Oxford, 1846). Consult: Charles Bigg, *The Christian Platonists of Alexandria* (London, 1886); Adolf Harnack, *Geschichte der altchristlichen Literatur*, vol. ii (Leipzig, 1893); C. T. Cruttwell, *Literary History of Early Christianity* (2 vols., New York, 1899).

PANTAGRUEL, *Fr. pron.* pän'tä'gru'él'. The son of the giant Gargantua and the chief character in Rabelais's romance, *Gargantua et Pantagruel*. In the fifteenth-century mysteries the name is given to a demon who throws salt into the mouths of sleeping persons, and Rabelais made the character King of the Dipsodes (thirsty). Like his father, Pantagruel is the hero of various burlesque adventures imitating the exploits of chivalry.

PANTALEON (?-305 A.D.). A Roman saint, physician, and martyr, born, it is supposed, at Nicomedia in Bithynia. He studied medicine and became special physician to the Emperor Galerius. He was a Christian and was martyred as such. He is the patron saint of physicians, and his feast is kept on July 27.

PANTALEON. A large dulcimer, named by Louis XIV, in honor of its inventor, Pantaleon Hebenstreit. The pantaleon was the direct precursor of the pianoforte (q.v.).

PANTELEGRAPH. See CASELLI, GIOVANNI.

PANTELLARIA, pän'tel-lä-rä', or **PANTELLERIA**. A small island in the Mediterranean Sea between Sicily and Africa, belonging to the Province of Trapani, Sicily (Map: Italy, C 6). It is of volcanic origin and has an extinct crater, 2743 feet high, and several hot springs. The soil is fertile, producing grapes, cotton, wheat, and olives, and the harbor on the northwest coast has considerable shipping. Chief town, Pantellaria. Pop., 1901, 8619; 1911, 8873.

PANTENIUS, pän-tä'né-us, THEODOR HERMANN (1843-). A German novelist. He was born at Mitau, Courland, studied theology in Berlin and Erlangen, and for six years taught at Riga, where he also edited the *Baltische Monatsschrift* (1870-76). He lived at Leipzig, was editor of the weekly *Daheim* (1876-1906) and of *Völkchen und Klasings Monatshefte* (1886-1906), and in 1891 followed his journals to Berlin. Pantenius wrote, under the pseudonym of Theodor Hermann, some excellent sketches and novels, portraying life in Lithuania and Courland, such as *Die von Kelles* (1885), *Wilhelm Wolfschild* (2d ed., 1873), *Allein und frei* (1875), *Das rote Gold* (1881), and *Kurlandische Geschichten* (1892); also *Der falsche Demetrius* (1904), a historical monograph. His collected novels were published in nine volumes (Bielefeld and Leipzig, 1898-99). Consult his autobiographical *Aus meinen Jugendjahren* (Leipzig, 1907).

PANTHEISM (from Gk. *πᾶς*, *pas*, all + *θεός*, *theos*, god). The name given to any system of speculation which identifies the universe with God (*acosmism*) or God with the universe.

Pantheism has often been the expression of an intense religious consciousness (as in Spinoza). The term "pantheism" was apparently coined by John Toland in the eighteenth century, but the antiquity of the view it designates is undoubtedly great, for it is prevalent in one of the oldest known civilizations in the world, the Hindu. Yet it is a later development of thought than polytheism (q.v.). Hindu pantheism, as *acosmism*, is taught especially by the Upanishads (q.v.) and by the Vedanta (q.v.). The Hindu thinker regards man as born into a world of illusions and entanglements, from which his great aim should be to deliver himself. Neither sense nor reason, however, is capable of helping him; only through long-continued, rigorous, and holy contemplation of the supreme unity (Brahma) can he become emancipated from the deceptive influence of phenomena and fit to apprehend that he and they are alike but evanescent modes of existence assumed by that infinite, eternal, and unchangeable being who is all in all.

Greek pantheism finds a somewhat inarticulate expression in Xenophanes (q.v.), but comes to full utterance in the writings of the Stoics (q.v.). To the views of Neoplatonists (see NEOPLATONISM) a pantheistic tendency is often attributed, but it is doubtful whether emanationism does not logically escape pantheism.

During the Middle Ages Johannes Scotus Erigena (see ERIGENA) was the most prominent Christian pantheist. Among the Arabian philosophers pantheism was current.

Modern pantheism shows itself in Nikolaus of Cusa (see CUSA) and Giordano Bruno (q.v.). Spinoza (q.v.) comes next among modern pantheists in the order of time, and he is perhaps the greatest, certainly the most rigorous and precise, of the whole class that either the ancient or the modern world has seen. Consult: Jacob, *A Manual of Hindu Pantheism* (Boston, 1881); G. E. Plumptre, *General Sketch of the History of Pantheism* (2 vols., London, 1881); J. A. Picton, *Pantheism: Its Story and Significance* (ib., 1905); also J. E. Erdmann, *History of Philosophy*, translated by W. S. Hough (3 vols., New York, 1892-97). See **BARISM**.

PANTHEON, pän-thē'on or pän-thē-on (Lat., from Gk. *Πάνθεον*, *pantheon*, temple to all the gods, neut. sing. of *πάνθεος*, *pantheios*, relating to all the gods, from *πᾶς*, *pas*, all + *θεός*, *theios*, divine, from *θεός*, *theos*, god). A temple to all the gods; hence, in particular, the greatest of such temples at Rome. The first Pantheon, erected in 27 B.C. by Valerius of Ostia for M. V. Agrippa, was a rectangular edifice behind the Baths of Agrippa. Injured or destroyed by lightning under Trajan, it was replaced in 123 A.D. by the existing circular edifice erected by Hadrian, as is proved by the discoveries of Chédanne in 1892. The porch of 16 superb colossal monolithic Corinthian columns appears to have been built with materials from Agrippa's porch and to have been altered from a decastyle to an octastyle porch, perhaps by Septimius Severus, 202 A.D. The Pantheon was further remodeled by Caracalla; it is possible that the interior paneling of the dome, which offers many puzzling problems, dates from this time and was hewn in the originally smooth vault. The Pantheon is the most perfectly preserved and the noblest work of Roman architecture. It consists of a circular hall, 142½ feet in internal diameter, supporting a dome

rising to a height of 142 feet, and pierced at the summit by an oculus or opening 27 feet in diameter—the only window in the edifice, but wonderfully effective in its effect of interior lighting. Seven niches for statues adorn the interior, which, however, has lost much of its original aspect since the “restorations” of 1748–56. The Pantheon, often called in Rome La Rotonda, has been since 608 A.D. a Christian church. In 663 it was despoiled of its statues and bronze adornments by the Emperor Constans II, and in 1632 the superb bronze vault of the portico was removed by Urban VIII, to be used in casting the baldacchino of St. Peter's Church.

The name Pantheon has been also applied to a number of domical buildings, among which the most important is the church of St. Genevieve at Paris, erected 1764–81 by the architect Soufflot in a somewhat cold but highly elegant and dignified classic style. During the Revolution it was desecrated and dedicated to the great men of France; according to the classic tendencies of the time it was called Le Panthéon and has retained this name ever since. In 1806 it was restored to Catholic worship and reconsecrated; secularized again in 1830, it was once more consecrated in 1851, but has since 1885 served as a secular national mausoleum, for which the greatest French artists have been employed to execute mural decorations of the highest historical and artistic importance. In plan it forms a Greek cross of about 255 feet in width and length, exclusive of the noble portico in front. The dome over the intersection, 70 feet in diameter and rising 268 feet in air, is adorned externally with a superb peristyle of 32 columns.

Bibliography. Giambattista Piranesi, *Antichità romane* (Rome, 1768); Hirt, *Osservazione sopra il Pantcon* (ib., 1791); C. E. Isabelle, *Edifices circulaires* (Paris, 1843); Friedrich Adler, *Das Pantheon zu Rom* (Berlin, 1872); Alphonse Gosset, *Les coupôles d'orient et d'occident* (Paris, 1889); R. A. Lanciani, *Ruins and Excavations of Ancient Rome* (Eng. trans., Boston, 1897). For illustration, see **DOME**.

PANTHER (OF. *pantere*, *panthere*, Fr. *panthère*, from Lat. *panthera*, *panther*, from Gk. *πάνθηρ*, *panthēr*, *panther*; perhaps connected with Skt. *pundarika*, tiger). 1. The leopard (q.v.). Sportsmen use the term rather loosely, although some attempt to distinguish the large, more uniformly colored specimens by this name. 2. In the United States, the puma. The name was more common in early days than at present and more often heard in the dialect corruption, *painter*, than in its true form. See **PUMA**.

PANTHER CAT. The ocelot (q.v.).

PANTHER COWRY. An Oriental cowry (*Cypræa pantherina*), red brown, densely spotted with blackish. See **COWRY**, and Colored Plate of **GASTROPODS**.

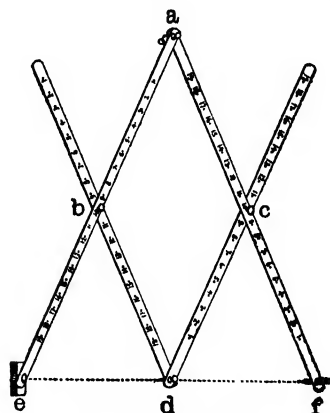
PANTHER TOAD. A large smooth-skinned toad of northwestern Africa, which has the upper parts adorned with a pattern of dark-edged, reddish-brown patches upon a yellowish ground, and the underparts white. This beautiful species is noted for the ease with which it may be tamed. A very similar species is to be found all over Central and South Africa. The former is *Bufo pantherina* and the latter *Bufo regularis*.

PANTICAPÆUM. The ancient name of Kertch (q.v.).

PANTIN, pân'tân'. A town of France in

the Department of Seine, situated northeast of Paris just outside the fortifications. It has sugar refineries and manufactures railway cars, boilers, chemicals, perfumes, glass, and oilcloth. Pop., 1901, 29,716; 1911, 36,350.

PANTOGRAPH (from Gk. *πᾶς*, *pas*, all + *γράφειν*, *graphein*, to write). An instrument used to make an outline copy of a map, design, drawing, or other picture either at the same scale or larger or smaller. It consists of four rods so joined as to form a parallelogram. One of the rods is pivoted about a fixed axis, while the apparatus is supplied with a tracer or point which is moved over the original drawing and a pencil which makes the line of the copy. A form of the pantograph which is extensively used is shown in the illustration. The rods are jointed at *a*, *b*, *c*, and *d*, so that *ab* is equal to *cd* and *ac* to *bd*, thus making the figure *abcd* a parallelogram. At *d* and *f* are the tracing point and pencil respectively, while at *e* the rod is pivoted so as to move freely. The points *e*, *d*, and *f* are in a straight line, which is maintained no matter how the framework is moved about *e*. The triangles *bed* and *acf* are similar, and the distance traversed by the point *f* with respect to that traversed by *d* will depend on the ratio of *ac* to *af*. It is of course possible



SIMPLE PANTOGRAPH.

to interchange *f* and *d*, and in that case there will be a reduced drawing made. By means of screws or pins at *b* and *c* the ratio of the sides of the parallelogram and the scale of reduction may be altered to suit the artist, the appropriate scale being marked on the arms. There are several forms of pantographs and instruments in which numerous refinements in the way of rollers, pivots, suspenders, etc., are introduced. Its invention is ascribed to Christopher Scheiner, a Jesuit priest, in 1603, and a description of the instrument was published at Rome in 1631. Consult J. B. Johnson, *Theory and Practice of Surveying* (17th ed., rewritten by L. S. Smith, New York, 1910).

PANTOJA DE LA CRUZ, pân-tô'hâ dâ là krôoth, JUAN (1551–c.1609). A Spanish portrait and historical painter, born in Madrid. He was a pupil of Sanchez Coello, whom he succeeded as court painter to Philip II. He continued in that position under Philip III and repeatedly painted the portraits of both these monarchs, besides those of many other members of the royal family. His style resembles that of his master, and their work is frequently

confounded, but Pantoja exaggerated Coello's faults and is more remarkable for care and finish than for vigor and freedom. He also painted some fine altarpieces. In the Madrid Museum may be seen a "Birth of the Virgin," a "Nativity," besides portraits of Charles V (2), Philip II, Queen Isabel de Valois (2), and others; in the Pinakothek at Munich the portraits of Archduke Albrecht (1600) and his consort Isabella (1599), and in the Vienna Museum portraits of the Infanta Anna and the Infante Philip.

PANTOMIME (Lat. *pantomimus*, from Gk. *παντομιμος*, one who acts by dancing and dumb show, all-imitating, from *πᾶς*, *pas*, all + *μιμος*, *mimos*, imitator, from *μιμεῖσθαι*, *mimēisthai*, to imitate). The art of dramatic representation without words, through expression by attitudes and gestures. Among the Romans the term *pantomimus* was applied to the actor himself. Whether pantomimic performances had a distinct existence under the Republic it is hard to say, but Augustus showed great favor to this kind of entertainment, which seems to have arisen from the older custom of separating the actor and the reciter of dramatic dialogue; the fact also that in the great open theatres the Roman public could see much more easily than it could hear probably contributed to the popularity of mute acting. As the *pantomimi* wore masks, no facial mimicry was possible; everything depended on the movements of the body. There was, however, commonly at the rear of the theatre, a choir, which sang the story by way of interlude or accompaniment; and as the subjects presented in dumb show were chiefly mythological love stories, they were consequently well known to the spectators. The earlier *pantomimi* came singly upon the stage, acting successively all the characters involved in the story; later several appeared together. The most celebrated *pantomimi* of the Augustan age were Bathyllus (a freedman of Mæcenas) in comedy and Pylades and Hylas in tragedy. The class soon spread over Italy and the provinces and became so popular with the Roman aristocracy, who used to invite male and female performers to their houses to entertain their guests, that Tiberius thought it necessary to check the vanity of the *pantomimi* by issuing a decree forbidding the senators to go to their houses and knights to be seen walking with them on the streets. Under Caligula they were again in favor, and Nero even went the length of acting in a pantomime. From this period the *pantomimi* enjoyed unbroken popularity so long as paganism held sway in the Empire.

Pantomimic elements have always been found in the popular theatres, notably in the early Italian *commedia dell' arte*, in which were developed the characters of Harlequin, Pantaloon, Columbine, and the rest of their familiar troupe. In France in the seventeenth and eighteenth centuries the word "pantomime" was applied to a kind of mythological spectacle at the Opéra, in which allegorical characters appeared in appropriate costumes. The great *ballets d'action* of Noverre were really pantomimic in character. In the first half of the nineteenth century, at the famous little Théâtre des Funambules in Paris, pantomime enjoyed for some years a remarkable revival under the genius of Debureau and his associates.

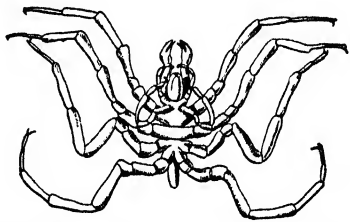
In England the first pantomime is said to have been produced at Drury Lane in 1702. It

was *The Tavern Bilkers*, by a dancing master named John Weaver, another of whose pantomimes, *The Loves of Mars and Venus*, had a remarkable success. But it is to the noted harlequin John Rich that the establishment of the familiar Christmas pantomime is generally credited. In December, 1723, he brought out at Lincoln's Inn Fields *The Necromancer, or the History of Dr. Faustus*, by way of rivalry to *Harlequin Dr. Faustus*, which had been produced at Drury Lane not long before. Pantomimes were not then, however, limited to the Christmas season, but were regarded, as they have sometimes been since then, as a means for filling the theatre's treasury and supplementing the attractions of the legitimate drama. English pantomime was further developed by the coming in 1758 of the Grimaldi family. Joseph Grimaldi (q.v.), who was born in 1779, was especially clever at inventing tricks and devising machinery. *Mother Goose* and others of his harlequinades were long popular. A special feature in the early part of the last century was the "transformation scene," in which was made the change of characters to the harlequinade proper, or latter part of the programme. The subjects of these pantomimes have been generally found in popular tales like those of Aladdin, Blue Beard, Cinderella, or Little Red Riding Hood.

In America, up to the present century, pantomime made only sporadic appearances and was insignificant in dramatic history. The success of such a piece as *Humpty Dumpty* (1870), with George Fox as clown, was a rare exception to the rule. The twentieth century, however, was to witness in its early years an extraordinary development and a world-wide vogue of pantomime in the form of the moving picture or photoplay, which is really pantomime seen as it were in a mirror, the actors in this latest dramatic novelty relying entirely, in true pantomimic fashion, upon movement, gesture, attitude, and facial expression to tell the story of the drama in which they are cast and to reveal the emotions of its dramatic personae.

Consult: Isaac Disraeli, "The Pantomimical Characters," in *Curiosities of Literature* (12th ed., London, 1841); Champfleury (pseud.), *Souvenirs des Funambules* (Paris, 1859); Ludwig Friedländer, *Darstellung aus der Sittengeschichte Roms* (Leipzig, 1890); R. J. Broadbent, *A History of Pantomime* (London, 1901); Otto Driesen, *Die Ursprung des Harlekin* (Berlin, 1904). See BALLET: HARLEQUIN; MIME; ETC.

PANTOPODA (Neo-Lat. nom. pl., from Gk. *πᾶς*, *pas*, all + *πούς*, *pous*, foot). An aberrant group of arthropods, which seem to stand nearer the Arachnida than any other class. They are



A TYPICAL PANTOPOD, OR "NO-BODY CRAB."

spider-like in form, with very long slender limbs arising from a remarkably small body, whence they have been called "no-body crabs." Each of the four pairs of legs contains a long caecal pro-

longation of the stomach. The body consists of a cephalothorax, consisting of an anterior proboscis, succeeded by three segments, and one thoracic segment, behind which are three free thoracic segments and a minute rudimentary abdomen. To the cephalothorax are attached four pairs of appendages, one or both of the first two of which may end in a forceps. These are succeeded, in the male alone, by a pair of vigorous legs and the first pair of thoracic legs, while each of the three free thoracic segments bears a pair of very long legs; there are thus in all seven pairs of appendages. The animal breathes through the walls of the body, and, as in all marine arthropods, there are no urinary tubes. In most of the forms there is a slight metamorphosis, the larva having three pairs of appendages. In one form the larvæ are internal parasites in certain hydroids. These sea spiders live at various depths from between tide marks to deep water. The group was formerly named Pycnogonida. By some authors they are supposed to be allied rather to Crustacea than to Arachnida, having one more pair of limbs than any arachnid.

PÁNUCO, pá'nū-kō. A river in Mexico, rising by several head streams on the Mexican Plateau and flowing northeastward to the Gulf of Mexico. In its lower course it forms the boundary between the states of Tamaulipas and Vera Cruz. With the construction of the jetties the bar at its mouth has been removed, and it is now accessible to steamers of 24-foot draft. Tampico (q.v.), at its mouth, is now one of the most important ports in Mexico. The famous drainage canal of the valley of Mexico empties into a tributary of the Pánuco.

PANUM, pi'nūm, PETER LUDWIG (1822-85). A Danish pathologist, born at Ronne, Isle of Bornholm. He studied medicine at Kiel and Copenhagen. His government sent him in 1846 to the Faroe Islands to treat an epidemic of measles. Returning to Copenhagen, he practiced there until 1850, though taking part meanwhile in the war of 1849. In 1850, by government appointment, he went to Bandholm (Laaland) to suppress the cholera. Panum in 1851 became a member of the medical faculty of the University of Copenhagen, to which, after a period as assistant professor of pathology at Kiel, he returned in 1863 as professor of physiology. His important works include *Experimentelle Untersuchungen zur Physiologie und Pathologie der Embolie, Transfusion, und Blutmenge* (1864), which established his reputation, and *Haandbog in Menneskets Physiologi* (5 vols., 1865-72). With Key, of Stockholm, he founded and edited *Nordisk Medicinsk Arkiv* (Stockholm, 1869 et seq.).

PANURGE, pi'nūrh'. An important character in Rabelais's *Gargantua et Pantagruel*. He is discovered by Pantagruel at Paris and becomes his friend.

PANY'ASIS, or **PANY'ASSIS** (Lat., from Gk. Πανύσιος) (?-c.454 B.C.). A Greek epic poet of Halicarnassus; a relative, probably an uncle, of Herodotus, the historian. He was put to death by Lygdamis, the tyrant of Halicarnassus, for assisting his native town in a fight for freedom. He was the author of a poem in 14 books and 9000 verses, entitled *Heraclea* (*Exploits of Heracles*), which led the critics of the Alexandrian school to rank him among the five great epic poets. According to Suidas he was also the author of *Ionica* (Ἰωνικά), an elegiac poem of 7000 lines on the history of Neleus, Codrus, and

the Ionian colonies. The fragments have been edited by Tzschirner (1842), and by Kinkel in the *Epicorum Græcorum Fragmenta* (1877). Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

PÄNZER, pän'tsēr, GEORG WOLFGANG (1729-1805). A German bibliographer. He was born at Sulzbach, studied theology at Altdorf, and lived at Etzelwang, a suburb of Nuremberg, and in that city as pastor and author. He was for several years director of the city library and wrote: *Geschichte der römisch-katholischen deutschen Bibelübersetzung* (1781); *Entwurf einer Geschichte der deutschen Bibelübersetzung M. Luthers von 1517-81* (1783); *Annalen der altern deutschen Litteratur* (1788); *Älteste Buchdruckergeschichte Nürnbergs* (1789); *Annales Typographici* (1793-1803), a valuable catalogue of the old prints of all countries (down to 1536), in 11 volumes.

PAOAY, pā'ō-y'. A town of north Luzon, Philippines, in the Province of Ilocos Norte. It lies near the west coast, on a small lake of the same name, 13 miles south of Laoag. Pop., 1903, 12,743

PAOLA, pā'ō-lā. A city and the county seat of Miami Co., Kans., 44 miles by rail south by west of Kansas City, on the St. Louis and San Francisco, the Missouri Pacific, and the Missouri, Kansas, and Texas railroads (Map: Kansas, H 5). It is the seat of the Ursuline Academy for Girls and has a public library. The city is in a productive farming and stock-raising country, rich also in natural gas. There are flour and feed mills, brick and tile works, and a radiator factory. Paola was first settled in 1855 and in 1869 was chartered as a city. The water works are owned by the municipality. Pop., 1900, 3144; 1910, 3207.

PAOLA, SAINT FRANCIS OF. See FRANCIS OF PAOLA.

PAOLI, pi'ō-lē, CESARE (1840-1902). An Italian historian. He was born at Florence, where he was employed in the record office in 1861, was connected with the archives of Siena in 1865-71, and then returned to Florence, where in 1874 he became professor of paleography and diplomacies at the Istituto di Studi Superiori. In 1887 Paoli became editor of the *Archivio storico italiano*, to which he contributed largely.

PAOLI, PASQUALE (1725-1807). A Corsican patriot, born at Morosaglia. His father, having taken a leading part in the insurrection against the Genoese, was obliged to flee to Naples in 1739. There Paoli received an excellent education. In July, 1755, he was summoned to Corsica and elected captain general of the island and the chief of a democratic government. He energetically and successfully applied himself to the reformation of the barbarous laws and customs of the island and at the same time to the expulsion of the Genoese, who lost in a short time nearly all their strongholds. The fleet of the Genoese was also defeated, and they were obliged to seek help from France. Finally, in 1768, Genoa ceded the island to France. Paoli refused all offers of the French government and continued to struggle for the independence of his country, but was defeated by the superior force of the Count de Vaux, and the French became masters of the island. After continuing the vain struggle for a year Paoli was compelled to take refuge on board a British frigate, in which he sailed for England, where he was well

received and granted a pension by the King (1769). Twenty years afterward the French revolution of 1789 recalled him to Corsica as lieutenant general and military governor. Subsequently, when the island became a department, he was made President of the administration and commander of the National Guard. After the execution of Louis XVI and the bloody scenes of 1793, Paoli's attitude towards the Revolution changed. With the active sympathy of England he organized in 1793 a revolt against the Convention. He was proscribed by that body and made general in chief and President of the Council by a *Consulta* which assembled at Corte. He now openly allied himself with Great Britain and favored the landing of 2000 British troops on the island in 1794, with whose aid he drove out the French. He was forced, however, to surrender the island to the English. Disappointed in his hope of being made Viceroy and finding his influence over the Corsicans gone, he retired from the island in 1796 and spent the remainder of his life in England, where he died near London, Feb. 5, 1807. In 1889 his body was removed to Corsica and there buried with great honor and solemnity. The earliest account of Paoli is found in James Boswell, *Account of Corsica* (Glasgow, 1768). Consult also Arrighi, *Histoire de Pascal Paoli* (Paris, 1843), and Bartoli, *Histoire de Pascal Paoli* (new ed., Bastia, 1891).

PAOLO VERONESE, pa'ô-lô vâ'rô-nâ'zâ. See VERONESE, PAUL.

PAOMBONG, pa'ôm-bông'. A town of Luzon, Philippines, in the Province of Bulacân, on the Pampanga River, 2 miles west of Malolos. Pop., 1903, 8554.

PAOTINGFU, pa'ô-ting'fôo (locally abbreviated into *Pao-fu*). A walled departmental city of China, capital of the Province of Chili. It lies about 80 miles southwest of Peking and 76 west of Tientsin, it is connected by rail with Peking, being an important station on the Lu-Han Railway from Peking to Hankow (Map China, L 4). The city contains several old temples, a Mohammedan mosque, a university, and several very good streets with well-filled shops, including a very large number of curio and book shops. The city was occupied by the allied troops during the Boxer Rebellion on Oct. 19, 1900.

PÁPA, pa'pô. A town in the County of Veszprém, Hungary, situated on the Tapoleza, about 60 miles southeast of Pressburg (Map Hungary, E 3). It has an extensive palace of the counts of Esterházy with a park gate brought from the Tuileries at Paris, a house in which Matthias Corvinus lived, three monasteries, and a Protestant Gymnasium. The manufactures include pottery, tobacco, and textiles. Pop., 1900, 17,426; 1910, 20,150, chiefly Roman Catholic Magyars.

PAPACY (OF. *papacie*, from ML *papatia*, papal office, from Lat. *papa*, pope, bishop, father). The see of Rome considered as an historic institution, claiming to be the head of and centre of unity for the whole Christian Church. The origin of the primacy of Rome is, according to the Roman tradition, to be found (1) in the leading part played by the Apostle Peter in the New Testament records, and (2) in the alleged historic fact of a residence of Peter at Rome as head or bishop of the Christian community there. On the first basis is constructed a theory of a divine commission given to Peter by Jesus

Christ, in virtue of which Peter was invested with the three attributes of king, priest, and teacher over all the followers of his master. On the second basis the Roman church has built up its practical earthly structure of influence and power. The identification of the Petrine idea with Rome was needed to localize and make concrete the abstract claims of a divine commission. Whatever powers were conveyed to Peter by Jesus Christ were now held to be continued in full measure to his duly appointed successors in the Roman bishopric. Although a majority of Christians reject both the Roman interpretation of the Petrine commission and the historical proof of a "bishopric" of Peter in Rome, and still more emphatically deny any connection whatever between these two sets of ideas, the historian finds abundant explanations of the origin and growth of the Roman supremacy without resorting to these sources. Doubtless the tradition of an apostolic origin was a powerful aid to the bishops of Rome in establishing their claims to supremacy.

The Roman community was certainly one of the earliest Christian foundations. It enjoyed the prestige of the work and of the martyrdom of the great Apostles, Peter and Paul. It was the centre of life of the vast Roman Empire and the focal point towards which all ideas streamed in and from which they were redistributed in effective form. Rome, however, had never been an important source of ancient culture. Her gifts to the world were law and administration; her culture was always a borrowed one. This same tradition of practical administrative skill was now to be continued by the Church. The authentic records of Roman Church life during the first two centuries are few, and many instances of the exercise of papal power at this time are not to be found.

The evidences of an aggressive, dominating jurisdiction appear very clearly in the administration of Victor I (193-203). This active and zealous churchman was bent upon securing uniformity in the outward practices of the Church, and he made the existing variations in the time of celebrating Easter a test question. He demanded of the Eastern churches agreement with the Roman Easter period and threatened them with excommunication if they refused. Excommunication, as the refusal to share Christian fellowship with an offending brother, was the right of every church, but we distinctly see here the Roman practice of treating it as a punishment to be inflicted by a superior for disobedience. Irenæus, Bishop of Lyons, himself a Syrian, but in agreement with Victor on the Easter question, admitted the *potentior principatus* of Rome, a phrase naturally quoted by Roman controversialists to support their claims of right. They also cite, as justification of these claims, a letter of Clement I to the Corinthians (95 or 96 A.D.), the epistles of St. Ignatius, and passages of Tertullian, Origen, and other Christian writers of the second and third centuries. Whatsoever may be the value of these testimonies, as cited to sustain the claims of papal supremacy in these early ages, the subsequent fact of a papal domination is outlined distinctly in historical perspective by the end of the fourth century.

The Western world turned as naturally to Rome in religious as in secular matters, partly as the result of the habit of centuries, partly because there was no other resort. Papal Rome

met the demand with a steadiness and prudence worthy of the great ecclesiastical tradition to which she was succeeding. In matters both of faith and practice she was always to be found on the side of a staunch but liberal orthodoxy. While Gnostics on the one hand and Montanists on the other were trying to make of the Church a select esoteric community of the specially initiated, Rome steered carefully between the extremes and lent all her weight to the "Catholic" or universal idea of the Church, as the medium of salvation for all men. On the vexed questions of heretical baptism and ordination and the treatment of the "lapsed" her position was always moderate and liberal. While the theologians of the Eastern world were speculating with philosophical refinements over the great Christian problems, the Roman church quietly but persistently held fast to the idea of a mystery of redemption not to be solved by any human philosophy, but to be accepted once for all by an act of faith. When, in the storms of the Germanic invasions, the weak and cowardly emperors deserted Rome, the Roman bishops repeatedly stood forward in their place and dealt with the invaders in the name of a power greater than their own.

The earliest point at which we can clearly discern the existence of a well-developed organization of papal power is in the administration of Leo I (440-461). He grasped, as none of his predecessors had done, the vast range of his opportunity. He aimed to establish, both in the East and in the West, a system of papal vicariates through which the Roman jurisdiction could be enforced and the Roman forms of faith and practice maintained. Eastward from the Adriatic his success was only partial and temporary. The pressure of Greek Christianity backed by the forces of the Greek Empire was too great, and we may from this point practically dismiss the East from our view. At the Council of Chalcedon (451) the formula of faith presented by Leo became an authoritative statement of the Christological problem. In Gaul the rising metropolitan power received a serious check in Leo's severe treatment of Hilary of Arles, who had on insufficient evidence deposed Chelidonius, Bishop of Besançon. In 452 Leo went out, armed with none but spiritual weapons, to meet the terrible Attila and actually turned him back in the full tide of victory. In 455 he again faced a Vandal invasion from the south and succeeded in gaining at least milder terms for the doomed capital.

Especially clear does this Roman leadership appear in the dealings with those Germanic peoples who for a longer or shorter time occupied the soil of Italy and organized there an actual administration of government. The popes of this period, nominally subject to the emperors at Constantinople, never really questioned the de facto sovereignty of the barbarian rulers in Italy. With Odoacer (476-493), and then with Theodoric the Ostrogoth (493-526), we find them in relations of friendly temporal subjection. Many cases of papal privilege and several disputed elections were referred to these barbarous and heretical chiefs of tribes, and their decisions were accepted. It was the wise policy of Rome at this early stage to conform itself to actual conditions and make its profit out of them. This de facto allegiance was readily transferred to Constantinople when, after the death of Theodoric, the armies of Justinian under Belisarius

and Narses finally drove the Ostrogoths out of Italy (535-553). This revival of Byzantine sovereignty was, however, the most serious disaster that could have happened to the papal idea. Again and again popes were made to feel the rough hand of the Empire if they ventured to act against its will, even on a matter of doctrine. The prestige of Rome was in danger of disappearing if she were to become merely one among the numerous patriarchates under the fitful dictation of Constantinople. It was really an advantage when the dreaded Lombards swarmed over into the Po valley (568) and rapidly drove the Byzantine garrisons from most of the country east of the Apennines. The Lombard terror forms the background of the papal history for nearly 200 years, but it was one of the means through which the importance of the papal institution was recognized and justified.

These were the conditions under which Gregory I the Great (590-604) came to power. From his correspondence we gain for the first time a clear impression of the economic side of the papal administration. We find a considerable total of landed properties scattered from Africa, through Sicily and Italy, to Gaul, managed directly by papal agents and serving as the chief financial basis of the Roman bishopric. Gregory, a prudent manager and astute politician, knew how to keep on good terms with the Empire and even succeeded in making some impression on the Arian Lombards in the direction of their ultimate conversion to Catholicism. He kept up an active correspondence with the Catholic Merovingian princes of the Franks and was the originator of the conversion of the heathen Anglo-Saxons to Roman Catholic Christianity. In a spirit of wise charity for all human diversities Gregory I laid the foundations for a papal system which would have made the Roman bishop the guide and harmonizer of Western Christendom. As time went on, the hold of the Eastern Empire upon Italy became weaker and weaker. In vain popes implored emperors for help against the Lombards. The Mohammedan conquest absorbed all the energies of the declining Empire, and Rome must turn elsewhere for the material support it needed. Gregory's relations with the Franks gave the clew for the future. So long as the Merovingian dynasty lasted nothing could be done; but when the new and vigorous house of Pepin began to displace the Merovingian princes, the opportunity came. Papal appeals to Charles Martel (Major Domus, 714-741) were flatly refused, but his son, Pepin, needing a sanction for his usurpation of the Kingdom, found it worth while to win this of Rome as the price of deliverance from the Lombard terror. More than this, he guaranteed to the papacy the temporal sovereignty over an ill-defined stretch of territory including Rome and a considerable surrounding country. See PAPAL STATES for the subsequent history of the temporal sovereignty.

With the coronation of Charles the Great as Roman Emperor by Pope Leo III (800) a new phase of the papal power begins. The revival of the Imperial name was doubtless intended to connect the actual domination of the Frankish people with the traditions of the ancient Roman world. It was, however, to be several generations yet before the importance of this new connection was to be evident. No emperor from Charles to Otho the Saxon held a position that could in any sense be called Imperial.

Even the title disappeared for more than a generation before Otho. Meanwhile the papacy kept on quietly developing the constitution under which it was to do its great work. The administration of Nicholas I (858-867), coincident with the notable rise of intellectual culture in West Francia, serves to indicate this progress. Nicholas I was keen to seize every occasion to assert papal right of supreme jurisdiction. 1. As defender of a sound Christian morality he took up eagerly the cause of Theutberga, the rejected wife of King Lothair II of Lorraine, and carried it against the support of the fighting men and the whole clergy of Lorraine to a complete triumph. 2. He assailed the metropolitan power in the person of the great Archbishop Hincmar, the most important prelate in the North, on the old question of the right of a subordinate clergyman disciplined by his local superior to appeal directly to Rome.

With the tenth century we find the papacy in a phase which seemed at times to imperil all it had gained. Its three functions—the bishopric of Rome, the government of a Roman state, and the headship of Latin Christianity—were often in hopeless conflict, but never more than now. In the furious strife of local parties in which Rome, like every other Italian city, was involved, the papacy came to be hardly more than the spoil of party victory. Candidates of every variety of incapacity and unsuitableness were set up by rivals in politics, and, even if they succeeded in maintaining their hold upon the bishopric and the Roman territory, there was little question of any influence upon the movement of affairs outside this field. It is the most convincing proof of the need in that age of some such central religious authority in Europe that men continued to pay deference to an institution so careless of its own credit and its own future.

Two causes were destined to bring the papacy once again into the great currents of European Christianity. The first of these was the renewal of the Empire on a German basis. The entrance of the Saxon people into the Latin-Christian culture (c.830) resulted in a great strengthening of the purely German as distinguished from the half-Romantic elements of the Western world. In 919 the German kingship passed with Henry I into Saxon hands. His son, Otho I (937-973), took up the Kingdom, no longer as a Saxon thane, but as the born King of all Germans, and after 25 years of varying success saw his idea of kingship fairly realized. For nearly 40 years the Empire had gone begging for a power strong enough to come and take it. In 961 Otho crossed the Alps as of right and in 962 was crowned Emperor at Rome by Pope John XII, whom he soon uncanonically deposed on accusations of every possible iniquity. He then caused the "election" of a capable Roman layman, Leo VIII, and maintained him with his sword. He bound the clergy and nobility of Rome by solemn oaths to elect their popes in future "canonically" and to seek for such election the approval of the Emperor. Thus it was thought to establish a formal balance of rights between these two branches of the highest earthly power. If the papal sanction be needed to make the Emperor, no less should Imperial approval be necessary to a valid papal election. But no sooner was the Imperial camp removed from Rome than all the evils of local factional strife

broke out again. To end the perpetual conflict, Otho III (983-1002), a youth of generous enthusiasms, tried the experiment of a Roman residence in conjunction with a German pope, Gregory V, of his own making. For a moment the problem seemed solved, but a new outbreak of Roman fury drove him from the city to his death.

Meanwhile the Church was developing a new energy through the force of its monastic principle, the second cause alluded to above. The monastery of Cluny in Burgundy began from its foundation about 910 to exercise an influence upon clerical life quite without precedent. This took the form of a purification of the priestly office by ridding it of the frequent vice of simony and by strictly enforcing the rule of priestly celibacy. The reaction of this movement upon society at large is seen in the efforts to bring about the peace of the land known as the "Peace of God" and the "Truce of God." In all this great activity the papacy as such took no part, but the time came when these ideas took possession of it and made it do their bidding.

The two processes we have noticed—the rise of the Empire and the purification of the Church—come together in the middle of the eleventh century. Another period of papal depression had followed the work of the Othos, and once more the papacy became the prey of contending local factions. The office was tossed about in shameless "deals" or by open violence. In the year 1046 three persons were claiming the papal power on different grounds. The scandal was too great, and the "Romans" appealed to the Emperor Henry III. In the Synod of Sutri (1046), held on the borders of the Roman territory, Henry brought about the removal of all three claimants and nominated a worthy German prelate who was accepted by the Romans. Two other Germans, also nominated by the Emperor, followed in rapid succession. The last of these was Bruno, Bishop of Toul in Lorraine, who, as Pope Leo IX (1049-54) and under the guidance of the monk Hildebrand, began the aggressive policy of Church reform through papal action, which is the most important feature of papal history for the next century. Though nominated by the Emperor, Leo saw plainly that to succeed he must be free from all outside control and rely upon the old Roman traditions. He began his administration by a journey to France and Germany, where in two synods, at Rheims and at Mainz, he proclaimed the articles of the Cluny programme, especially that against simony, and demanded the allegiance of the Northern prelates in his crusade against these evils. The conscience of Europe, roused already by the work of the monastic reformers, responded with satisfactory readiness. At Rome Leo IX found himself involved in an entirely new political situation. The Northern conquerors of southern Italy had reached a point in their expansion where it was important for them to have a definite legal status. They threatened to encroach upon the papal territory and actually routed the Pope's army in the battle of Civitate (1053). But the wisdom of Leo turned this rout into a victory by persuading the Normans to become the vassals of the holy see on condition that their power within certain limits should be recognized as a legitimate sovereignty.

The sense of papal right as paramount is

seen still more plainly in the action of Nicholas II (1058-61). To check the disorders consequent upon the papal elections and to establish the electoral process on a firm and permanent basis, he procured the passage at the Synod of 1059 of a decree whereby the election of the Pope was henceforth to be in charge of the Roman "cardinals," including members from all three clerical orders. The initiative was to lie with these, but they were then to procure the assent of the "Roman people," and a certain undefined right of participation was reserved to the Emperor. On these three elements—the Roman cardinals, the Roman people, and the Roman Emperor—rested the papal constitution for the next 200 years. The greatest conflicts of this period arose from attempts to define more precisely the limits of each element. On the whole, the cardinalate gained steadily upon the other factors and succeeded ultimately in winning exclusive control, not, however, without some decisive modifications in its own make-up.

The papacy was now definitely committed to the work of reform. The influence of Hildebrand grows more and more perceptible. Under his far-seeing direction what had been started as a purely moral movement becomes in the clearest sense a political one as well. Adding to the two articles of the Cluny programme a third—the prohibition of lay investiture—he combined all three under the one general demand for the "freedom of the Church" from all external control. 1. The celibacy of the secular clergy was to be the guarantee that the clergy should be free from all the obligations arising from marriage and the social and economic duties that attend it. 2. The abolition of simony was to make the clergy free from all the complications of worldly interest that must arise if clerical office were to be bought and sold for any valuable consideration whatever. 3. The prohibition of lay investiture was to free the clergy from any relation towards the state which might interfere with the exclusive control of all clerical interests by the supreme ecclesiastical authority, the papacy itself. The effect of the first was to separate the priest from the family; of the second, to separate him from the temporal interests of the society about him; of the third, to cut him off from any secular service to the state. It was "freedom" in the sense of a separation that must tend to place a gulf between the clergy and all purely secular interests. On the other hand, it is doubtful if any other process could have stayed the progress of a fatal secularization of the Church that threatened to absorb it entirely in the life of the society of the full feudal period.

As to the question of simony, all thinking men were agreed that it was an evil. The celibacy of the clergy in the major orders was already well established in the habits of most of the European populations, and the sympathy of the masses was decidedly setting towards its extension to the minor orders as well. It was therefore a well-considered policy that led Hildebrand from the moment of his accession as Pope Gregory VII (1073-85) to throw his whole energy into the fight against the lay investiture.

The moment chosen for the conflict with Germany was most favorable. Henry III, the vigorous champion of Imperial right and duty as the guardian of papal honor, died in 1056,

leaving a son, Henry IV, six years old, who was accepted as King under the regency of his pious mother, Agnes of Poitou. In 1073 this son was a clever, headstrong youth of 23, already at odds with many parts of his Kingdom, but prepared to press to the utmost all his royal rights. The first proclamation against lay investiture was in 1075 and, though couched in general terms, was plainly aimed at Germany. To give up the right of investiture would have meant for the German King the loss of the most important means of political control, and Henry threw himself upon the loyalty of his clerical subjects. A German synod at Worms (1076) denounced the Pope in unmeasured terms and threatened him with deposition. He replied by excommunicating the King, whose political enemies utilized the excommunication as a weapon to keep him in a semi-imprisonment until Gregory could carry out his purpose of settling the whole German question in person at a German assembly. Gregory was on his way to this meeting at Augsburg when Henry IV, leaving Germany, hurried over the Alps, met the Pope in the famous interview at Canossa, and won from him the absolution which reinstated him in the allegiance of his subjects and thus averted the grave political danger of a settlement of German affairs by a papal council on German soil. Through the long reign of Henry IV, under Gregory and his successors, the fight went on. The Pope repeatedly excommunicated the King and sanctioned the election of antipopes. The King replied in virtue of his Imperial rights, actual or to be, by "deposing" popes and causing the election of a series of antipopes. The immediate question of the investiture was lost sight of in the larger issue—whether church or state was to control. Henry V (1106-25) had joined the papacy against his father, but was no sooner King himself than he was forced into an opposition as much more dangerous as he was more powerful. In 1111 he was able to force the papacy into a momentary agreement that the clergy of the Empire should be exempt from the Imperial investiture on condition that they should surrender all their temporal property. This agreement was promptly rejected by those most interested on both sides and led to the final settlement in the Concordat of Worms (1122), whereby the dual nature of the clerical office as at once temporal and spiritual was recognized. The investiture with the spiritualities (ring and staff) was left to the papacy, while that with the temporalities (sceptre) was held by the Emperor. Similar but less violent conflicts in France and England led to a similar result.

A new phase of the conflict between church and state begins with the accession of the emperors of the house of Hohenstaufen. The Hohenstaufen (Ghibelline) policy was to extend the German Kingdom, under the disguise of the Empire, over Italy. In this ambition it was checked at every turn by the rising power of the Italian city republics. Frederick Barbarossa (1152-90) sought to incorporate these communities into his administration by placing governors (*podestà*) over them and utilizing their growing wealth for his larger plans. Led by Milan, the Lombard communes steadily resisted. Milan, destroyed in 1162, was rebuilt by her neighbors, and at the head of the great Lombard League gave the Emperor such a de-

eat at Legnano (1176) that in the Peace of Constance (1183) he conceded practically all the claims of the cities to independence. Throughout this fight the communes were steadily supported by the papacy. Their party the Guelph) was also the papal party; and though outside the cities there were many territorial nobles and inside there was always a noble faction that looked towards the Emperor, the great masses of the rising industrial population, organized in their craft and merchant guilds, were sturdily Guelph and in every crisis expected the support of the Pope. Henry VI, son of Frederick I (1190-97), had elaborate plans for refeudalizing Italy and sinking the communes in greater territorial units. Through his marriage with the heiress of the Norman Kingdom in the south and the birth of a son in 1194, he seemed to see the realization of the Hohenstaufen policy. His death, the consequent confusion in Germany, and the accession of the great Pope Innocent III (1198-1216) saved Italy for the time and gave to the papal power one of its greatest moments of triumph.

Innocent III realized more completely than any pope before or after him the Hildebrandine ideal. He was able to bring King John of England to surrender the overlordship of the land to him for his support against his nobles. He compelled Philip Augustus of France to take back his rejected wife. In the struggle for the German crown he championed Otho the Guelph against Philip of Hohenstaufen (1198-1208), but when Otho as King (1208-14) proved that no emperor could be a Guelph, as no pope could be a Ghibelline, Innocent turned against him at once. He gave his support to France against Germany and England in the battle of Bouvines (1214), by which his ward the young King Frederick of Sicily gained the Empire. At a Lateran council in 1215 Innocent displayed, as it had never been displayed before, the legal system on which the working of the papal idea depended.

The prestige of the papacy had been greatly increased by its leadership in the Crusades. The Crusade had been commended by Gregory VII. Events in the East had aroused attention so it soon afterward, and Urban II (1088-99) had made it the chief object of his administration. Throughout the long and not always creditable history of the Crusades (1096-1270) it was the papacy that gave to it whatever of unity and dignity it had. From Innocent III we may begin to note the gradual decline of the mediæval papacy. It had thriven upon the absence of strong national governments in Europe, and the rapid rise of the new nations closed up one by one the channels through which the papal power had made itself felt. The reign of Frederick II (1215-50) is one long conflict between the Imperial and papal schemes in Italy. On the whole, the Emperor was beaten, but the prestige of the papacy as a universal power was injured. The attempt of the Hohenstaufen to maintain a government in Italy was frustrated, but the papacy, by bringing the Angevin rulers from France into the South, sowed the seeds of new disaster. Rudolph of Hapsburg (1273-91) began a new policy for the Empire—to leave Italy out of the question in return for a free hand in Germany—and every deviation from this wise policy by his successors only showed again how completely the mediæval ideals of public life were passing

over into those of the modern world. The attempts of Henry VII (1308-13) and Louis the Bavarian (1314-47) to affect the balance of Italian politics proved utter failures.

On the other hand, the same thing is true of papal attempts to enforce discipline on the rulers of Europe. Boniface VIII (1294-1303) came to the papacy as the leader of the cardinalate in an unprecedented crisis. His predecessor, Celestine V, a pious recluse, had so completely fallen into the hands of the Neapolitan Angevins that he had raised to the cardinalate a number of French and Neapolitan prelates. He had then, largely under pressure from Boniface, resigned the papacy, and now the cardinals found themselves under the domination of such a will as had not been seen in the papal office since Innocent III. His violent attempts to break down the faction of the Colonna drove his enemies to the court of Philip IV of France, and there they found a fertile soil for their complaints. Philip, a completely modern ruler, needing all the money there was to spare in France, laid a tax upon the clergy. Boniface, in a series of able documents, laid down again the Hildebrandine doctrine of the freedom of the Church. Philip appealed to the national sentiment as expressed for the first time in the States-General and won his fight. Boniface, defeated and abused by the personal enemies he had made, died, the last great exponent of the mediæval papacy.

The wreck of the mediæval scheme of a papacy and an empire working in a harmony that was never attained threw the papacy upon a new alliance. The influence of France now replaces that of Germany. The result of the second conclave after the death of Boniface was the election of a Frenchman, Clement V (1305-14). The new Pope was met at Lyons by King Philip in person, and as a result of this interview he never left France. The cardinals summoned across the Alps obeyed, and thus began the French residence of the papacy, the "Babylonian Captivity" at Avignon (c.1305-77). This "exile" came about naturally through the working of the cardinal system. The French influence had secured certain cardinals from Celestine V; these decided the choice of Clement, and now he in turn was free to appoint enough more French cardinals to decide the character of the college for a generation to come. The close relation of the papacy to France withdrew from it the sympathies of the other nations, notably of England. It seemed in danger of losing entirely that Roman character which was its only source of authority. Pressure was continually brought to induce the popes to return to Rome; several attempts to do so were made, but were hindered by the French interests of the cardinals. Finally Pope Gregory XI did return and died at Rome (1378). The new election, held under fear of violence from the "Roman people," resulted in the choice of an Italian, Urban VI; but within a few months the French influence succeeded in raising sufficient doubts as to the validity of this election to justify the cardinals in choosing another Pope, Clement VII. Thus, still by the regular working of the papal machinery, the Church found itself, for the first time in its history, involved in a schism in which both claimants rested upon the same basis, a lawful election by cardinals.

Both parties appealed to the nations for support. In general, the Northern peoples sym-

pathized with the Roman Pope, France and Spain with the French one; but the really important result of the Great Schism (1378-1418) was the discussion it aroused as to the nature of the papacy and its relations to the Church at large. The feeling was constantly gaining force that the Church as a whole was misrepresented by a system which threw all the weight of the papal authority into the hands of a small body of persons at Rome. To change these persons to Frenchmen was no relief. What was demanded was a larger share to the nations in the Church constitution. These opinions gained in clearness as the difficulty of breaking the schism through the action of the cardinals became more apparent. The remedy was that most feared by the curial party at all times, a general council; but years passed before a way could be found for calling a council that would be respected. Finally, in 1409, the "union cardinals" on both sides united in this work, and the Council of Pisa supported them in making a new election. The Pope chosen, Alexander V, lived but a few months, and the same interests succeeded in putting forward John XXIII, who failed utterly to maintain the respect of the Church as against the two claimants set aside at Pisa, who now renewed their claims. See PISA, COUNCIL OF.

The Church thus found itself in a triple schism, honeycombed with the heresy of Wiclif and Huss and burdened with ecclesiastical abuses which every one saw, but which no one knew how to remedy without danger to the system itself. The Council of Constance (1414-18) met under these conditions. It first attacked heresy by examining and burning John Huss, who, relying upon the safe-conduct of the Emperor Sigismund, had voluntarily put himself into its power. It then proceeded to endless discussions of abuses and the means of relief, only at last to express a series of pious wishes and leave their execution to the Pope, whose election was accomplished by a joint commission of the cardinals and the council. Naturally the new Pope, Martin V, of the Roman family of the Colonna, failed to consider himself bound by the action of a council that could not agree within itself upon vital questions, and his "reforms" were of the most superficial kind. The papacy had come out of the trial of schism and opposition unchanged in its quality. It could not avert the assembling of the Council of Basel (1431-48), but it steadily opposed it. So long as the council could keep the respect of Europe it could maintain its existence, and at least succeeded in demonstrating its capacity to do things that the papal administration had failed to accomplish; but the longer it lasted the more apparent it became that Europe was not ready to exchange the traditional authority of Rome for the novel tyranny of an irresponsible council. Especially when the council proceeded of its own right to choose a pope, without reference to the Roman tradition, it became clear that such a pope could not be supported. What the Council of Basel really accomplished was to furnish to the nations a pretext for asserting their rights over their own local churches more firmly than ever, as, e.g., in the case of France, through the Pragmatic Sanction of Bourges (1438). When this was done the governments were comparatively indifferent to the general question of the papal constitution itself, and Nicholas V (1447-55)

stands at the beginning of a period more splendid than any other in the papal annals. The papacy now entered into the politics of Europe as one among the temporal powers (see PAPAL STATES), fell in with the prevailing enthusiasm for art and letters, and sought to direct the course of the Renaissance movement. In the meantime opposition was slowly and silently gathering in the North, which culminated in the Reformation movement and directly challenged the traditional supremacy of the papacy. The Protestant Reformation affirmed as the ground of its justification the financial tyranny, the spiritual indifference, and the antinational propaganda of the papacy. It formulated as its programme a return to what it claimed to be the early principles of a private interpretation of Scripture and a personal approach of every Christian to his God without other mediation than that of his personal faith. Against this demand the papacy set itself with all the resources of its past. Between the two ideas there was no compromise, and the result was secession. As late as 1541 it was hoped by many sanguine persons on both sides that some common ground might be discovered, but the Council of Trent (1545-63) reaffirmed in unmistakable terms the existing principles of the papacy as it had come to be. Recognizing the need of "reform" in many details, the council carefully avoided any action that might seem like compromise with rebellion. While not admitting in theory the fact of schism, the papacy henceforth was obliged to recognize it in practice and to devote all its energy to maintaining its hold upon what it had left and extending its sway over new lands. For later history, see ROMAN CATHOLIC CHURCH; PAPAL STATES. See also articles on the popes.

Curia Romana. The Roman Curia is the cabinet of the Pope, the departments of which aid him in the government of the Universal Church, and is made up of (a) the Roman Congregations and (b) the Offices and Tribunals of the Curia. There are ten Congregations and three Tribunals which are treated in more detail under ROMAN CATHOLIC CHURCH, *Curia Romana*.

Bibliography. *Bullarium Romanum Magnum* (19 vols., Rome, 1655-1857); A. Von Reumont, *Geschichte der Stadt Rom* (Berlin, 1867-70); Lorenz, *Papstwahl und Kaiserthum* (ib., 1874); Potthast, *Regesta Pontificum Romanorum, 1198-1304* (ib., 1874-75); Pflugk-Hartung, *Acta Pontificum Romanorum Inedita* (5 vols., ib., 1881-88); J. Langen, *Geschichte der römischen Kirche, quellenmässig dargestellt* (Bonn, 1885-93); F. Rocquain, *La cour de Rome et l'esprit de réforme avant Luther* (Paris, 1893-97); Ferdinand Gregorovius, *History of the City of Rome in the Middle Ages* (Eng. trans., London, 1894-1900); Valois, *La France et le grand schisme d'occident* (Paris, 1896-1902); F. T. Tout, *The Empire and the Papacy 913-1273* (new ed., London, 1901); Mirbt, *Quellen zur Geschichte des Papstthums* (2d ed., Tübingen, 1901); W. F. Barry, *The Papal Monarchy from St. Gregory the Great to Boniface VIII* (New York, 1902); *Cambridge Modern History*, vol. i (ib., 1902); A. D. Greenwood, *The Empire and the Papacy in the Middle Ages* (London, 1902); H. K. Mann, *Lives of the Popes in the Early Middle Ages* (ib., 1902 et seq.; 12 vols. to 1915); Mandell Creighton, *History of the Papacy* (6 vols., ib., 1902-04); H. H. Milman,

History of Latin Christianity (4 vols., New York, 1903); E. A. Freeman, *Western Europe in the Eighth Century and Onward* (ib., 1904); T. W. Allie, *The Throne of the Fisherman* (new ed., Chicago, 1906); F. K. Nielson, *History of the Papacy in the Nineteenth Century* (2 vols., New York, 1906); Ludwig Pastor, *History of the Popes from the Close of the Middle Ages*, translated by Antrobus and Kerr (12 vols., London, 1906-12); L. M. O. Duchesne, *Beginnings of the Temporal Sovereignty of the Popes, A. D. 754-1073* (Chicago, 1908); Leopold von Ranke, *History of the Popes during the Last Four Centuries*, translated by Foster (3 vols., London, 1908-12); H. G. E. Krüger, *The Papacy: Its Idea and its Exponents* (New York, 1909); Anthony Guggenberger, *The Papacy and the Empire* (St. Louis, 1911); Bryce, *The Holy Roman Empire* (new ed., New York, 1911).

The following list of popes is from Wetzer and Welte's *Kirchenlexikon* and may be assumed to represent the conclusions of the best modern Roman Catholic scholarship. Down to Pius II it follows in general the results reached in Duchesne's learned edition of the *Liber Pontificalis* (Paris, 1886); for the later dates use has been made of Gams, *Series Episcoporum*, and of Reumont, *Geschichte der Stadt Rom* (Berlin, 1870).

Peter	d. 67 ?	Benedict I	575-579
Linus	67-79 ?	Pelagius II	579-590
Anacleus	79-90 ?	Gregory I	590-604
Clement I	90-99 ?	Sabinianus	604-606
Evaristus	99-107 ?	Boniface III	607
Alexander	107-116 ?	Boniface IV	608-615
Sixtus (Xystus) I	116-125 ?	Deusdedit	615-618
Telesphorus	125-136 ?	Boniface V	619-625
Hyginus	136-140 ?	Honorius I	625-638
Pius I	140-154 ?	Severinus	640
Anicetus	154-165	John IV	640-642
Soter	165-174	Theodore I	642-649
Eleutherus	174-189	Martin I	649-653
Victor I	189-198	Eugenius I	654-657
Zephyrinus	198-217	Vitalian	657-672
Callistus	217-222	Adedeatus	672-676
Urban I	222-230	Donus	676-678
Pontianus	230-235	Agatho	678-681
Anterus	235-236	Leo II	682-683
Fabianus	236-250	Benedict II	684-685
Cornelius	251-253	John V	685-686
Lucius I	253-254	Conon	686-687
Stephen I	254-257	Sergius	687-701
Sixtus (Xystus) II	257-258	John VI	701-705
Dionysius	259-268	John VII	705-707
Felix I	269-274	Sisinnius	708
Eutychianus	275-283	Constantine	708-715
Casus	283-296	Gregory II	715-731
Marcellinus	296-304	Gregory III	731-741
Marcellus	308-309	Zacharias	741-752
Eusebius	309 (310)	Stephen II	752-757
Miltiades	311-314	Paul I	757-767
Sylvester I	314-335	Stephen III	768-772
Marcus	336	Adrian I	772-795
Julius I	337-352	Leo III	796-816
Liberius	352-366	Stephen IV	816-817
Damasus I	366-384	Paschal I	817-824
Siricius	384-399	Eugenius II	824-827
Anastasius I	399-401	Valentine	827
Innocent I	401-417	Gregory IV	827-844
Zosimus	417-418	Sergius II	844-847
Boniface I	418-422	Leo IV	847-855
Celestine I	422-432	Benedict III	855-858
Sixtus (Xystus) III	432-440	Nicholas I	858-872
Leo I	440-461	Adrian II	867-872
Hilary	461-468	John VIII	872-882
Simplicius	468-483	Marinus I	882-884
Felix II	483-492	Adrian III	884-885
Gelasius I	492-496	Stephen V	885-891
Anastasius II	496-498	Formosus	891-896
Symmachus	498-514	Boniface VI	896
Hormisdas	514-523	Stephen VI	896-897
John I	523-526	Romanus	897
Felix III	526-530	Theodore II	897
Boniface II	530-532	John IX	898-900
John II	533-535	Benedict IV	900-903
Agapetus I	535-536	Leo V	903
Silverius	536-537	Christopher	903-904
Vigilius	537-555	Sergius III	904-911
Pelagius I	556-561	Anastasius III	911-913
John III	561-574	Lando	913-914

John X	914-928	Celestine V	1294
Leo VI	928	Boniface VIII	1294-1303
Stephen VII	928-931	Benedict XI	1303-04
John XI	931-935	Clement V	1305-14
Leo VII	936-939	John XXII	1316-34
Stephen VIII	939-942	Benedict XII	1334-42
Marinus II	942-946	Clement VI	1342-52
Agapetus II	946-955	Innocent VI	1352-62
John XII	955-964	Urban V	1362-70
Leo VIII	963-965	Gregory XI	1370-78
Benedict V	964	Urban VI	1378-89
John XIII	965-972	Boniface IX	1389-1404
Benedict VI	973-974	Innocent VII	1404-06
Benedict VII	974-983	Gregory XII	1406-15
John XIV	983-984	Alexander V	1409-10
Boniface VII	984-985	John XXIII	1410-15
John XV	985-996	Martin V	1417-31
Gregory V	996-999	Eugenius IV	1431-47
Sylvester II	999-1003	Nicholas V	1447-55
John XVII	1003	Calixtus III	1455-58
John XVIII	1003-09	Pius II	1458-64
Sergius IV	1009-12	Paul II	1464-71
Benedict VIII	1012-24	Sixtus IV	1471-84
John XIX	1024-32	Innocent VIII	1484-92
Benedict IX	1032-44	Alexander VI	1492-1503
Gregory VI	1045-46	Pius III	1503
Clement II	1046-47	Julius II	1503-13
Damasus II	1048	Leo X	1513-21
Leo IX	1049-54	Adrian VI	1522-23
Victor II	1055-57	Clement VII	1523-34
Stephen IX	1057-58	Paul III	1534-49
Benedict X	1058-59	Julius III	1550-55
Nicholas II	1058-61	Marcellus II	1555
Alexander II	1061-73	Paul IV	1555-59
Gregory VII	1073-85	Pius IV	1559-65
Victor III	1087	Pius V	1566-72
Urban II	1088-99	Gregory XIII	1572-85
Paschal II	1099-1118	Sixtus V	1585-90
Gelasius II	1118-19	Urban VII	1590
Calixtus II	1119-24	Gregory XIV	1590-91
Honorius II	1124-30	Innocent IX	1591
Innocent II	1130-43	Clement VIII	1592-1605
Celestine II	1143-44	Leo XI	1605
Lucius II	1144-45	Paul V	1605-21
Eugenius III	1145-53	Gregory XV	1621-23
Anastasius IV	1153-54	Urban VIII	1623-44
Adrian IV	1154-59	Innocent X	1644-55
Alexander III	1159-81	Alexander VII	1656-67
Lucius III	1181-85	Clement IX	1667-69
Urban III	1185-87	Clement X	1670-76
Gregory VIII	1187	Innocent XI	1676-89
Clement III	1187-91	Alexander VIII	1689-91
Celestine III	1191-98	Innocent XII	1691-1700
Innocent III	1198-1216	Clement XI	1700-21
Honorius III	1216-27	Innocent XIII	1721-24
Gregory IX	1227-41	Benedict XIII	1724-30
Celestine IV	1241	Clement XII	1730-40
Innocent IV	1243-54	Benedict XIV	1740-58
Alexander IV	1254-61	Clement XIII	1758-69
Urban IV	1261-64	Clement XIV	1769-74
Clement IV	1265-68	Pius VI	1775-99
Gregory X	1271-76	Pius VII	1800-23
Innocent V	1276	Leo XII	1823-29
Adrian V	1276	Pius VIII	1829-30
John XXI	1276-77	Gregory XVI	1831-46
Nicholas III	1277-80	Pius IX	1846-78
Martin IV	1281-85	Leo XIII	1878-1903
Honorius IV	1285-87	Pius X	1903-14
Nicholas IV	1288-92	Benedict XV	1914

The following list of antipopes is given on the authority of Hergenröther (1824-90), who was Cardinal-Prefect of the Vatican Archives.

Hippolytus (?)	III century	Guibert or Clement III	1080-1100
Novatian	251	Theodorice	1100
Felix II	355-365	Aleric	1102
Ursinus	366-367	Maginulf	1105
Eulalius	418-419	Burdin or Gregory VIII	1118
Laurentius	498-501	Anacleus II	1130-38
Constantine II	767	Victor IV	1159-64
Philip	VIII century	Pascal III	1164-68
Anastasius	855	Calixtus III	1168-77
Leo VIII	956-963	Innocent III	1178-80
Boniface VII	974	Nicholas V	1328-30
John XVI	X century	Robert of Geneva or Clement VII	1378-94
Gregory	1012	Amadeus of Savoy or Felix V	1439-49
Sylvester III	1044		
Benedict X	1058		
Honorius II	1061-72		

The residence of the popes at Avignon began about 1305 with Clement V and ended with Gregory XI about 1377.

There was no residence of the popes at Pisa. A council was held there, but not a general council, and all its acts were condemned by Gregory XII. There were at the time (1409) three claimants for the pontifical throne; Alexander V, Gregory XII, and Benedict XIII.

PAPAGO, pā'pā-gō. An important tribe of Piman stock (q.v.), originally occupying a large portion of Arizona, south of the Gila, and extending across the border into northern Sonora, Mexico. They were missionized by the early Jesuits and Franciscans and are now practically all Catholic. They are agricultural, industrious, and peaceable towards the whites, but were compelled to wage constant war with the Apache until a recent period. They were recognized as citizens under the Mexican government, but their rights were disregarded on the annexation of the territory to the United States, and, by the seizure of the best lands and water supplies by the American settlers and land companies, the majority have been rendered homeless nomads. Hundreds of them earn good wages as railroad laborers. They number 3798 on San Xavier Reservation, Tucson, and the intervening territory to the south. The number in Sonora is unknown. Consult K. S. Lummholtz, *New Trails in Mexico* (New York, 1912).

PAPAIN. A digestive ferment derived from the juice of *Carica papaya*, a South American fruit tree belonging to the order Papayaceæ. This ferment is a mixture containing vegetable globulin, albumoses, and peptone. It digests all forms of proteid or albuminous matter, whether coagulated or not, and whether the medium in which it works is acid, alkaline, or neutral. It is a rapid solvent of false membrane. Papain is serviceable in gastroenteritis, gastritis, infantile diarrhœa, and fermentative dyspepsia. It is prepared in powder and tablet form, and a glycerole is also made. Papain is also known as papayotin and caricin and is not official.

PAPAL GUARANTEES, LAW OF. A law passed by the Italian Parliament at Florence in 1871, shortly before its transfer to Rome, which aimed at making the papacy and the Italian government mutually independent. It guaranteed to the Pope the diplomatic privileges of a sovereign power with its own ambassadors and its own court in the midst of Rome, separate postal and telegraphic communications with foreign countries, and an allowance of 3,225,000 francs a year. It allowed further to him and his successors the use of the Vatican and Lateran palaces and certain other buildings and precluded all government officials from entering any of these buildings without permission. It relinquished the royal exequatur and placet, or the necessity of the King's assent to the publication and execution of acts of the ecclesiastical authority; it exempted the bishops from any oath of allegiance to the crown and gave the clergy complete freedom of meeting. It put an end to appeals to the civil courts against acts of spiritual discipline, but, on the other hand, it denied to the Church courts the aid of the civil tribunals in enforcing their decisions and made the discussion of religious subjects completely free. This plan, of which a draft had been found among the papers of Cavour and which attempted to realize his ideal of "a free church in a free state," was opposed by the Liberals as leaving the Pope in far too independent a position. It was submitted to the Powers with the view of obtaining international sanction, but this failed through the refusal of England. Partly, perhaps, owing to French influence, the Pope decided to refuse these offers, to ignore the Italian government completely while remaining in Rome, and to seclude himself as a voluntary prisoner in

the Vatican. Consult J. W. Probyn, *Italy from 1815 to 1890* (London, 1891), and G. Gustine, *La loi des garanties* (Paris, 1901).

PAPAL STATES, or STATES OF THE CHURCH. The name applied to the territory in central Italy, varying in extent, which from the Middle Ages until the last half of the nineteenth century was under the temporal sovereignty of the Pope. The earliest origin of this dominion is difficult to assign to a definite year. Although the so-called Donation of Constantine is now known to have been a later invention, there is no doubt that he made many rich gifts to the Church, especially after his victory over Maxentius; the Lateran Palace, for 1000 years the residence of the popes, seems to have been given to them during his reign. Like other bishops, the bishops of Rome acquired by degrees not unimportant political rights, and when the seat of the Empire was removed to Byzantium it was partly their rich possessions that gave them their great influence in the affairs of Italy. By the time of Gregory the Great (590-604) the Roman see possessed at least 23 estates with a total area of some 1800 square miles in various parts of Italy and the adjacent islands, in southern France, and even in northern Africa. The beginning of full sovereignty in the modern sense may, however, be said to have come from the presentation of the town of Sutri by the Lombards to the Apostles Peter and Paul in the person of Gregory II (727). The Lombards were uncertain friends, however, and the popes were obliged to appeal to the Frankish Kingdom for aid against them. In 754 Pepin transferred considerable and definite territories to Pope Gregory III, and in the following year, brushing aside by conquest any claims which either the Lombards or the Byzantine Emperor made to these lands, placed the Pope in undisputed possession of them. (See DONATION OF PEPIN.) Charlemagne increased them, until they extended from Luna, near the present Lucca, to Capua, including the Duchy of Rome, the Pentapolis, Æmilia, and the Exarchate of Ravenna, or nearly the whole of central Italy.

This sovereignty, though attacked during the troubles of the tenth century by the Italian factions, increased gradually during the eleventh and twelfth. In 1014 the Emperor Henry II resigned half of Tuscany into the Pope's hands; Leo IX received the overlordship of Benevento from Henry III in 1052, and the principality came into the full possession of the holy see in 1077, on the extinction of the family which had ruled it. In 1115 the Countess Matilda of Tuscany left the Pope her fiefs of Parma, Modena, Reggio, and Garfagnana, and part of Mantua. They were, however, seized by the Emperor, and only part of southern Tuscany actually came into the Pope's hands. In these times, in any case, the power of the Pope was little more than a feudal suzerainty over a number of petty princes or over cities with their own government, who paid tribute to the popes and were bound to assist them with a military force in case of need. In France Gregory X gained the Comtat Venaissin from Philip III in 1274, and Clement VI bought the town of Avignon in 1348. During the Avignon period, however (c.1305-77), the temporal sovereignty of the popes over their Italian territories was menaced or weakened by the ambition of the great families, and Cola di Rienzi

even succeeded for a time in shaking it off from Rome itself. In the sixteenth century the popes entered so largely into the political movements of Europe, and were of such importance to the maintenance of the balance of power, that prudent statesmanship was able to increase their territory largely. Sixtus IV at the end of the fifteenth century established his jurisdiction over Romagna; additions were made of Bologna in 1512, Ancona in 1532, Camerino in 1545, Ferrara and Comacchio (the possessions of the house of Este) in 1598, Urbino in 1631, Castro and Ronciglione (the last additions) in 1649.

Great changes began with the end of the eighteenth century. In 1768 the Bourbon rulers of Naples seized Benevento and Pontecorvo, and in 1783 dissolved altogether the connection with the Roman see which had existed for more than seven centuries. Avignon and Venaissin were occupied from 1768 to 1774, as they had been twice in the preceding century, by the French Bourbons, and in 1791 passed under the jurisdiction of the French Republic. By the Treaty of Tolentino (1797) Pius VI was obliged to resign the three legations of Bologna, Ferrara, and Romagna into Napoleon's hands, and a year later the remaining territory was seized and erected into the Roman Republic. This was overthrown by the Second Coalition in June, 1799; on July 3, 1800, Pius VII entered Rome, which had been held by the Neapolitans, and reestablished the old constitution in his States, now deprived of Romagna, Bologna, and Ferrara. The French again took possession of them and in 1809 incorporated them with the Empire, Rome being reckoned as its second city. The Congress of Vienna in 1814 restored the States of the Church, now embracing the marches of Ancona and Camerino, the duchies of Benevento and Pontecorvo, and the legations, except a part of Ferrara, which Austria retained. In 1831 and 1848 there were risings against the government. The former was suppressed by the aid of an Austrian army; the latter assumed such proportions, even in Rome itself, that Pope Pius IX was forced to flee to Gaeta, while Rome was proclaimed a republic. He was restored by the arms of France in 1849. The Austrians held the legations for the Pope until 1859, and the French occupied Rome in his behalf (except for a part of 1867) until 1870. In July, 1859, on the withdrawal of the Austrian troops, the Romagna threw off the papal authority and declared its annexation to the Kingdom of Sardinia, or, as it was to become a few months later, of Italy. After the defeat of Lamoricière, the papal general (1859), Umbria, Urbino, and the Marches were annexed by Victor Emmanuel; and the isolated possessions of Benevento and Pontecorvo shared the same fate. In October, 1870, the French army having been withdrawn in July, the remnant of the Papal States voted for union with the Kingdom of Italy. It was the original intention of Victor Emmanuel's government to leave the part of Rome known as the Leonine city under the Pope's control as a compromise; but it was rejected equally by the Pope and by the inhabitants, and the Pope's jurisdiction was restricted within the limits of the Vatican, outside of which, as a protest against the legality of the Italian occupation, he has never set foot since 1870. Roman Catholics generally, while of course not considering the temporal power as in any way essential, yet regard it

as very expedient for the proper exercise by the Pope of his high functions that he should be independent and not the subject of any temporal ruler. This is maintained not only on theoretical grounds, but as demonstrated historically by the events of the Avignon captivity and by more than one incident of the period since 1870. See ITALY; PAPACY; PAPAL GUARANTEES, LAW OF.

Bibliography. Joseph Hergenröther, *Der Kirchenstaat seit der französischen Revolution* (Freiburg, 1860); J. J. I. von Döllinger, *Papstthum und Kirchenstaat* (Munich, 1861); H. E. Manning, *Temporal Power of the Pope* (London, 1871); Brosch, *Geschichte des Kirchenstaates* (2 vols., Gotha, 1880-82); W. F. Barry, *The Papal Monarchy from St. Gregory the Great to Boniface VIII* (New York, 1902); W. J. Stillman, *Union of Italy, 1815-1895* (new ed., ib., 1909); also the general histories of the Papacy.

PAPAV'ERA'CEÆ (Neo-Lat. nom. pl., from Lat. *papaver*, poppy). THE POPPY FAMILY. A family of dicotyledonous plants, mostly herbs or somewhat shrubby and usually with milky or colored juice. The family is characterized by its alternate leaves, regular flowers, caducous sepals (usually two), four to six petals, numerous stamens, and a single ovary which becomes a capsule containing numerous seeds. In some cases the capsule opens by small pores just under the expansion formed by the stigmas. In this way the seeds are well protected and escape only when shaken by the wind or other agencies. The family is distinguished for narcotic properties. Opium (q.v.) is its most important product. The juice of celandine (q.v.) is very acrid. A number of species are used in their native countries for medicinal purposes. The seeds yield fixed oil, which, with the exception of that obtained from *Argemone mexicana*, is bland. The flowers of many species are large and showy, most frequently white or yellow, sometimes red. Several kinds of poppy and of *Eschscholtzia* are frequent in gardens. There are about 23 genera and 115 species, widely distributed but most abundant in the north temperate zone. The chief representatives of the family in North America are bloodroot (*Sanguinaria*), celandine poppy (*Styliphorum*), several introduced species of poppy (*Papaver*), and prickly poppy (*Argemone*). See POPPY.

PAPAVERINE, pā-pāv'ēr-in. See ALKALOIDS.

PAPAW' (from Sp., Portug. *papaya*, from Malabar *papamaram*, the native name given to the tropical fruit that is also called papaya). The papaya, or tropical papaw (*Carica papaya*), is a common tropical plant largely cultivated for its edible fruits. The green fruits, as well as the whole plant, abound in a milky sap that contains the ferment papain (q.v.). The plant is of rapid growth, attaining a height of 12 to 15 feet, and bears fruit in 12 to 14 months from planting. The trunks seldom branch, and the fruits are borne from the axils of the large, long-petioled leaves. The plants are commonly propagated from seed, but they may be grafted and rooted under certain conditions. Monoecious, dioecious, and hermaphrodite plants occur, and experiments have shown that the character of flowering and the quality of the fruit may be greatly influenced by selective breeding. The fruits, which somewhat resemble a small cantaloupe, are a favorite breakfast fruit throughout the tropics generally. The name "papaw" is

also given to several species of *Asimina*, a genus of the family Anonaceæ, occurring in the eastern



AMERICAN PAPAW.

United States. The common papaw, *A. triloba*, is a small tree or shrub. See CUSTARD APPLE.

PAPAYOTIN. See PAPAIN.

PAPE, pāp, ERIC (1870-). An American landscape, genre, and historical painter and an illustrator. He was born in San Francisco and studied under Carlson in New York, and in Paris chiefly at the Ecole des Beaux-Arts under Gérôme and Laurens. After travels in France, Germany, and Egypt he formed an individual style distinguished by an almost barbaric splendor of conception, opulent fancy, and boldness of line. He first gained recognition through his genre and philosophic paintings, then became known as an illustrator and landscape painter. In 1898 he founded the Eric Pape Art School at Boston, which he directed until 1913. Characteristic paintings by him are "The Sphinx by Moonlight," "The Two Great Eras," "Nahib-icha," "Cerise and Gray," and the "Flute Player"; but perhaps his happiest inspirations are his 300 illustrations for Lew Wallace's *Fair God*. A very different appeal is made by his landscapes, which are simple, direct, and sincere, with something of the cosmic quality of Millet. They include "Early Morning, Annisquam," "A Breezy Morning," and "The Dying Day." Pape received medals and diplomas at various exhibitions.

PAPE, pā'pe, WILLIAM (1859-). A German historical and portrait painter. He was born at Karlshütte, near Rendsburg, studied at the Berlin Academy and in Paris, and learned fresco painting under Prell. He is known chiefly as a court painter, whose subjects are drawn from contemporary German history. Two of them, "One Empire, One People, One God" and "The Confirmation of the Crown Prince and Prince Eitel Friedrich," are in possession of the German Emperor. He deco-

rated a room in the new courthouse at Bielefeld and painted "Luther's Last Confession," in the Luther house at Eisleben. Among his portraits are those of the German Emperor and Empress, Prince von Bülow, Admiral von Tirpitz, and Count Ballestrem.

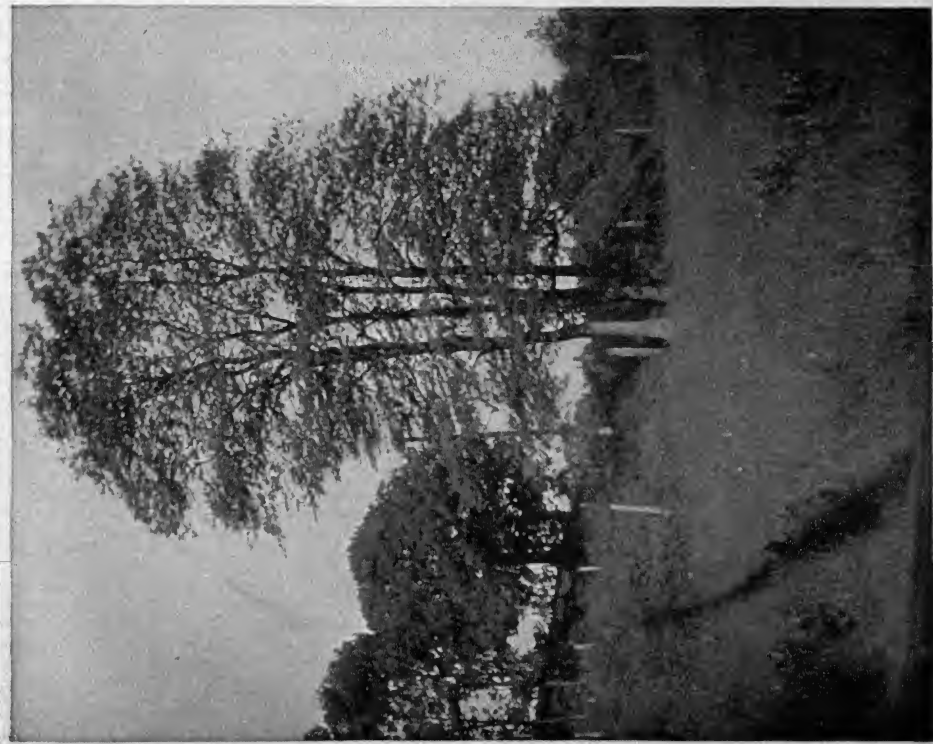
PAPĒETI, pápá'tē. The capital of the French possessions in the eastern Pacific. See TAHITI.

PAPER (OF., Fr. *papier*, from Lat. *papyrus*, from Gk. *πάπυρος*, *papyros*, *papyrus*). Although the word "paper" is derived from "papyrus" (q.v.), papyrus is not a paper at all, and the beginnings of the paper industry are not traced back to it, but to the genuine paper made by the Chinese from very early times. From the Chinese it spread to other races and was probably brought into Europe during the twelfth century through the Moors into Spain and at the time of the Second Crusade into Italy. About the year 1150 a paper mill was started at Fabriano, Italy, which became the principal centre for paper making, and this region continues the manufacture to the present day. From Italy the art spread to France and Germany, somewhat later to England, where it was not well established until the Revocation of the Edict of Nantes in 1685 sent many French paper makers into exile to England and America. In 1690 the first paper mill in America was built by William Rittenhouse at Roxborough, near Philadelphia. The first paper mill in New England was built by a company to which was granted by the Governor and Legislature in 1728 the sole privilege of making paper in the Province of Massachusetts for 10 years. In 1730 the manufacture of paper was begun by this company, and specimens of paper were shown to the Legislature.

Up to the beginning of the nineteenth century, while machinery was used to reduce the rags to a pulp, the formation of the sheet of paper was done entirely by hand, sheet by sheet, as described below. About 1798 Louis Robert, a workman in the mill of Didot at Essonne, France, patented an invention for making paper in an endless web, but it was not put to practical use till developed in England by Henry and Sealy Fourdrinier, who spent and lost a fortune perfecting the machine. They are properly considered the founders of modern paper making, and their machine is universally known as the Fourdrinier machine. So well was their development work done that the early machines differ in minor details only from the most modern machine running to-day.

Earliest Process of Manufacture. The method of manufacturing paper by hand from the inner bark of the paper mulberry, as practiced to-day by the Japanese, probably represents the method in vogue from the very earliest times. It is of interest not only on account of its antiquity, but because it presents in outline all other methods, which merely are adaptations of the processes here described. A sheet of paper is an artificially felted web of vegetable fibre, purified of perishable materials, so that the remaining fibres are more or less pure cellulose (q.v.). The process may be described as collecting the raw material, cleaning it by boiling with lye, macerating it to a fine pulp, diluting with water, forming a sheet on a porous surface (that the water may drain off), and drying the sheet of paper thus formed. The Japanese strip the paper mulberry of its bark, soak it in water till soft enough to strip the

PAPAW AND PERSIMMON



PERSIMMON (*Diospyros Virginiana*).



PAPAW OR MELON TREE (*Carica Papaya*).

outer bark, then separate the inner bark, dry in the sun, and boil with lye obtained by leaching wood ashes. After being well washed, the bark is now beaten into pulp by four men seated around a board of hard wood on which the bark is placed. The men pound with long wooden mallets and turn out each day about 80 pounds of pulp per man. The fibre is now mixed with sufficient water, and the sheet of paper formed on a sieve made of fine strips of bamboo. A wooden frame is fitted on the sieve to hold the right amount of liquid pulp. This elevated border is called in Europe the deckle and prevents the pulp from spreading beyond the limits of the sheet. After dipping the sieve into the vat of pulp, the paper maker dexterously shakes the mold in all directions as the water drains off, thus felting the fibres in all directions and making a strong sheet. The sheets are then spread out on a board and dried in the sun.

The European method of making paper by hand differs in several respects from the Japanese. The raw material used (originally linen rags) is too tenacious to be reduced to pulp by hand power, and the earliest European mills used a sort of trip hammer or pestle driven by a water wheel. This in turn was superseded by the modern beating engine or Hollander, invented by the Dutch in the latter part of the seventeenth century, as described below. The sieve used, instead of being made of bamboo, is of wire cloth, with a movable edge or deckle. The workman after forming the sheet removes the deckle, turning the damp sheet onto a sheet of woolen felt. A pile of these sheets, alternate paper and felt, is called a post, and is placed in a press to remove the water. The sheets are afterward hung up in a loft to dry and finished by sizing with glue or gelatin and smoothed by pressure or calender rolls. Hand-made paper always has four rough edges, while machine-made paper has only two. These are usually trimmed off unless an imitation of hand-made paper is wanted. The rough-edged paper is called deckle edge. Paper making is primarily an art and is dependent upon the skill of the individual paper maker. Hence there is no standard in paper.

Raw Materials. The preparation of any raw material for use as paper stock consists essentially in isolating the cellulose in the form of fibres of as great length as possible. As cellulose is the structural base of all plants, theoretically any plant might furnish the paper maker with material for his mill. It becomes therefore a question of cost of producing the pure cellulose, and quality of the product. The earliest plant used was the paper mulberry, whose fibres are very easily separated, and a fairly pure cellulose obtained by simply boiling with lye. As this plant does not grow in Europe, it is not used in modern paper making. The chief material used up to the middle of the nineteenth century was cotton and linen rags. These are already reduced to nearly pure cellulose by the processes of textile manufacture, and cleaning and boiling with an alkali is all that is needed to prepare the stock for pulp. Wood is the raw material of most importance to the paper maker to-day, and esparto grass (alfa) is used in England on a large scale. Straw, waste paper, old rope, jute butts, hemp, etc., are also used. The different processes of reducing the material to a suitable fibre will be considered later.

Process of Manufacture by Machinery.

Whether for hand-made or for machine-made paper, the preparation of rags for pulp may be divided as follows: (1) cleaning; (2) boiling; (3) washing; (4) bleaching; (5) beating or reducing to pulp. The preparation of substitutes for rags is practically the same, except that the boiling process is more drastic, varying with the substance used.

1. *Cleaning.*—Rags are received at the mill in bales more or less sorted into white, colored, linen, cotton, canvas, etc., but need, for the finer sorts of paper (in which alone rags are now used at all), a thorough dusting and further sorting by hand. The duster may be of various forms and removes dust and foreign substances by vigorous mechanical methods. The sorting is done by girls who stand before tables covered with wire screens through which dust and dirt sifts. The girls cut off buttons, rubber (a great curse to the modern paper maker, as it does not bleach and appears in the paper as black specks, besides sticking to rolls and clogging the straining screens), and other foreign substances, and sort the rags accurately into different grades. A further dusting and chopping into pieces a couple of inches long make the rags ready for boiling.

2. *Boiling.*—The rags are packed in a large horizontal boiler, called the rotary. This is provided with manholes for the admission and discharge of the rags and lime and is mounted on hollow trunnions through which steam is admitted. To clean the rags from all fatty, colored, and noncellulose impurities, a solution of lime is used and the rags cooked and slowly rotated under steam pressure for several hours, the amount of lime, pressure, and time of boiling varying according to circumstances. When sufficiently cooked the steam and liquor are blown off and the rags dumped out by slowly revolving the rotary with the manholes opened. The rags are now of a brown color, and most of the impurities have been saponified, combining with the lime to form insoluble compounds which can be washed away, or, in the case of colors, reduced to simple colorless compounds.

3. *Washing.*—The washing or beating engine is shown in the cut. It is also called the Hollander. It consists of a wooden or metal tub, 10 to 15 feet long, with rounded ends, in the

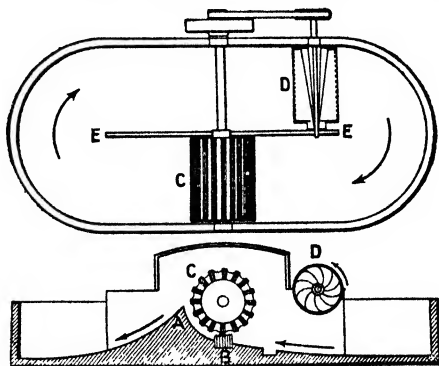


FIG. 1. PULP-BEATING ENGINE.

centre of which is a partition *E*, called the mid-feather; a roll *C* is provided with knives and revolves rapidly over a bed plate *B* of similar knives. The distance between the bed plate and

the roll is regulated by raising or lowering the supports of the roll with a wheel and screw. The rags after passing between the bed plate and the roll flow down the backfall *A* and around the mid-feather back to the starting point, as indicated by arrows. The washing engine is provided with a washing cylinder *D*, which is so made that as it revolves it scoops up the water, which flows out through its axis, the rags being kept out by a fine wire cloth surrounding the cylinder. The rags to be washed are put into the washing engine with enough water, the roll being raised so that the rags pass around freely without being beaten into pulp, as otherwise the dirt would be ground into the fibre. A large quantity of water is admitted, which is removed by the drum washer, as described above, and the rags are in this manner rapidly cleaned. The roll is now lowered gradually, and the rags slowly macerated, losing their characteristics of textiles, and being finally

the weight. As paper is usually sold by the pound, the latter consideration is not without its influence, the loading sometimes amounting to 33½ per cent. An addition of 10 per cent of mineral is not considered an adulteration. Bleached pulp has a yellowish cast, and to obtain a pure white a little blue is added, and papers that are colored in the pulp are prepared at this point. Sizing is added to prevent the absorption of ink. Unsized (or water-leaf) papers absorb water readily and cannot be used for writing with a pen. The sizing is of two kinds, vegetable (rosin) size, added at this stage of manufacture, and animal (glue) size, which is applied externally after the paper is made. The accompanying plate shows the beating engines in a "news" mill at Rumford Falls, Me. A boy is furnishing the second engine, putting in chemical fibre, while the ground wood is run in from the large pipe above. On the other side is seen a man getting out china clay from a cask.

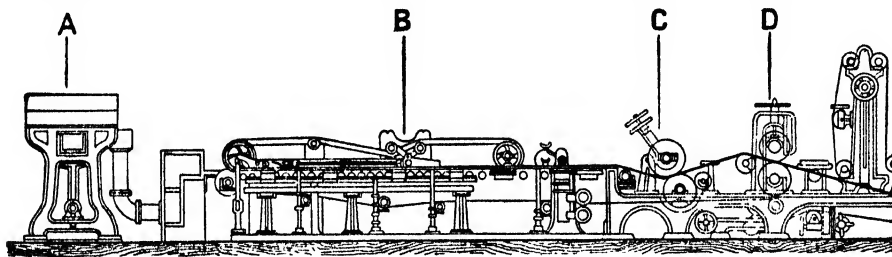


FIG. 2. FOURDRINIER MACHINE IN SECTION.

resolved into single fibres of varying lengths. When the washing is completed the washing cylinder is raised out of the beater and the supply of water cut off. The beating process is then continued a little longer till the pulp reaches the stage called half stuff, the practice varying in different mills.

4. *Bleaching*.—The pulp is now as white as it can be made without bleaching and is a light gray if medium-grade white and colored rags were used. The addition of a solution of chloride of lime (bleaching powder), decomposed by sulphuric acid, bleaches the pulp to a creamy whiteness. In America the bleaching is done in the washing engines, but in Europe a separate tub is often used. In place of chloride of lime a solution much used in France is prepared by electrolysis of magnesium chloride. After bleaching, the pulp is emptied into the drainers, large chambers with floors of porous tiles, where the moisture and surplus bleach drain off. The pulp is left some days in the drainers, till it is nearly dry. In Europe, in place of drainers, the pulp is usually dried by making up into thick sheets of paper on a machine similar to the wire of the Fourdrinier machine, called a *presspâte*.

5. *Beating*.—The half stuff is next put into the beating engines, which are similar to the washers but have no washing drum, and the knives are arranged to macerate the pulp faster. At this point the loading materials, color, and sizing are added, and if various fibres are used, such as rag, wood fibre, or esparto, they are mixed here, while the half stuff is being reduced to the very fine condition required for making into paper. Most papers contain a filler, usually china clay (kaolin, q.v.) or sulphate of lime (pearl hardening). This fills the pores, giving a more even printing surface, besides adding to

Rosin size is prepared as follows: A rosin soap is made by dissolving rosin with caustic soda or potash; this is added to the pulp in the beating engine and precipitated on the fibres by the addition of a solution of alum or sulphate of alumina. Paper thus sized is called engine-sized or rosin-sized paper, as distinguished from tub-sized or animal-sized, which will be described later.

The pulp may be beaten fine enough in the beating engine, but the American practice is to dump it into a stuff chest, a large circular receptacle, with a horizontal agitator to keep it from settling, and then to pump it through a so-called Jordan or refining engine into a second stuff chest, whence it is pumped to the Fourdrinier machine.

As indicated above, paper making is primarily an art. It is at the beating engine that the paper is really made. The final mixture upon leaving the beater may be called the real paper, for it is at that point that all its ingredients are brought together to grade the paper.

Jordan Engine. This is a most successful American invention, in universal use in the paper mills of America, but practically unknown in Europe, in spite of its large saving of time, space, and power. It was invented in 1862 by Joseph Jordan, of Paterson, N. J., who never benefited financially from the invention and was supported in poverty by the paper makers of America until his death. The Jordan consists of a stationary hollow cone mounted with knives on the inside which fits over a solid rapidly revolving cone mounted with similar knives on the outside. The pulp passes between these cones, and the knives can be brought close together or separated with great accuracy, so

that the degree of fineness of the pulp can be adjusted.

Fourdrinier Machine. This consists of the following parts: *A*, the screens; *B*, the wire, with dandy roll, deckle straps, and suction boxes; *C*, the couch rolls; *D*, the first press; *E*, the second press; *F*, the driers; *G*, the calenders; *H*, the reel; and *I*, the slitter.

A. The Screens.—From the second stuff chest the pulp, which is now diluted with a large amount of water, flows through sand settlers and regulating gates to the screens. These consist of brass plates with a large number of longitudinal V-shaped slits cut in them, the opening being very small, only a few thousandths of an inch. A continuous jarring is given to these plates, which forces the fine pulp through the slits, but the lumps and impurities are retained. In some forms of screen a vacuum pump is used combined with an oscillating motion of the screens, which keeps the pulp flow-

are impressed in the paper by affixing the required design on the dandy roll. A false watermark is sometimes made after the paper is partly dried by passing between rolls engraved with a design.

C. Couch Rolls.—At the end of the wire (i.e., where it turns down over a roll to return to the starting point) are the couch rolls, covered with felt, through which the wire passes bearing the web of paper. These rolls press the water out still more and consolidate the fibre, giving it strength to cross alone the gap between the wire and the felt of the first press roll. These rolls correspond in function to the pressure applied to the post of alternate sheets of damp paper and felts in hand-made paper.

D and E. The Press Rolls.—An endless woolen blanket (the felt) supports the tender web of paper through a pair of highly polished brass rolls under considerable pressure, giving the upper side of the sheet a smooth surface and

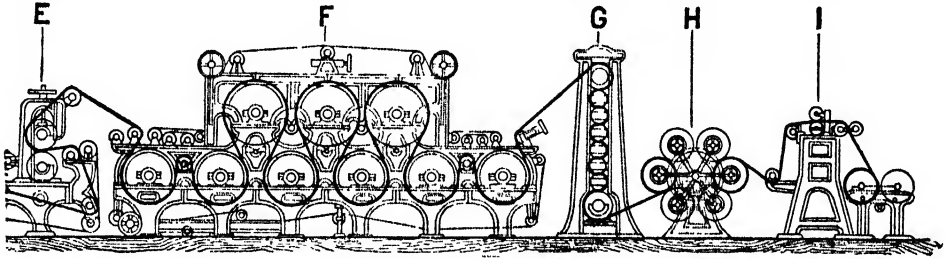


FIG. 2. FOURDRINIER MACHINE IN SECTION.

ing back and forth, preventing the clogging of the slits.

B. The Wire.—The strained and purified pulp flows over an apron onto an endless traveling wire cloth, the mesh of which is 60 to 90 threads to an inch. The wire is supported perfectly level on a great many small rollers (the table rolls), under which is a shallow wooden box, the save-all, into which much of the water runs, leaving the pulp on the wire. The water in the save-all contains much pulp and is used over again. The boundary of the flow of pulp on the sides is made by endless rubber bands, called deckle straps, which travel with the wire. These are adjustable so that varying widths of paper may be made. The frame supporting the wire receives a lateral motion, which greatly assists in the felting of the fibres into a strong sheet. The forward motion of the wire tends to arrange the fibres in the same direction, and the side shake is necessary to offset this tendency, giving strength in both directions. Notwithstanding, it is easy to tell by tearing which way a sheet of paper was made on the machine. The water drains rapidly away from the pulp, assisted by two or three suction boxes under the wire, which are connected with an air pump and exhaust the water much faster than would otherwise be possible. At this point, between the first and second suction boxes, is situated the dandy roll, a light cylinder covered with wire, which rests on the upper surface of the moist paper, giving it the impression of whatever design is on it. Wove paper has both sides impressed with the fine woven wire, i.e., the dandy roll is covered with the same wire as the paper is formed on. In laid paper, on the other hand, the dandy is covered with parallel wires, with a cross wire at intervals. Watermarks

leaving the impress of the felt on the underside. From the first press *D* the sheet runs under the second pair of rolls *E* and back through them in the reverse direction, thus smoothing the other side of the sheet and giving as even-sided results as possible.

F. The Driers.—The paper is now formed, and it only remains to dry it. The driers are a series of steam-heated metal cylinders, 2 to 4 feet in diameter, arranged in one, two, or three tiers. The paper is carried nearly round each in turn and on to the next, being held to the hot surfaces by an endless blanket, usually of cotton. Sometimes there are smoothing rolls when the paper is partly dried. The size and number of driers determine how fast a paper can be run. With a given machine thin papers can be run (and dried) very fast, thick ones slowly.

G. The Calenders.—After being thoroughly dried the web of paper is passed through a stack of smooth chilled iron rolls, which by their own weight and pressure applied by screws or weights smooths the paper and produces what is called machine-finished paper, as contrasted with supercalendered paper, described farther on. It is now wound on a reel.

H and I. The Reel and Slitter.—After being wound on a reel the paper is passed through the slitter, the rough outside edges trimmed, and if necessary the single web slit into any required widths. It is then rewound and is ready for shipment, if intended for printing in the roll or for coating; or for supercalendering, sheeting, and packing.

The Fourdrinier machine makes automatically an endless web of paper from 60 to 180 inches wide at a speed of 10 to 700 feet per minute. The plate shows the reels, calenders, and driers

of one of the largest machines in the world. This machine can make paper 180 inches wide. It can run at a speed of 650 feet per minute, and produce 76,000 pounds of paper in 24 hours.

Supercalenders. Much book paper requires a high finish, i.e., a very smooth surface, and this is given by passing it between alternate iron and compressed-paper rolls under great pressure. These machines are called the supercalenders. It is then sheeted, counted into reams of 480 or 500 sheets, and packed in cases or bundles.

Animal Sizing and Loft Drying. The finer grades of writing papers are not finished as here described, but when partly dried are passed through a vat of gelatin (glue) in solution, the excess being squeezed off by rollers, and either slowly dried by passing over a large number of hollow drums with fans inside or cut in sheets and hung in lofts to dry in the manner employed for hand-made paper.

The following are the main differences in the preparation of rag substitutes from the process given above.

Esparto grass comes from Spain and Africa and is very largely used in England. The grass is cleaned, dusted, and boiled with caustic soda under pressure, a so-called vomiting boiler being usually used; it is then washed and bleached in much the same manner as rags. It gives a white fibre of fair strength.

Straw is used largely in the United States, chiefly for strawboard, and not reduced to a pure fibre. Its characteristics are similar to esparto, but it is more difficult to reduce to pure cellulose, owing to the silica it contains, requiring a stronger alkali and higher pressure in boiling.

Wood Pulp. There are two kinds of wood pulp used in paper making, mechanical pulp, or ground wood, and chemical fibre. Of the latter there are three processes of manufacture, the soda process, the sulphite, and the sulphate.

Ground Wood is made by pressing blocks of wood obliquely (across the grain) against rapidly revolving grindstones, a stream of water carrying off the product, which is not chemically changed and has very little fibre or strength. It is used very largely, however, for cheap newspaper, chiefly in connection with chemical fibre, to impart greater strength. The plate (Fig. 1) shows a pulp grinder at Rumford Falls, Me., the stone being coupled directly to a turbine water wheel. It will be seen that there are three pockets, in which blocks of wood are placed and pressed simultaneously against the stone. The pulp is then screened to remove lumps, bleached if necessary, and either run directly into the beaters if made into paper at the same mill (as at Rumford Falls; see Plate, Fig. 2), or made into thick sheets by a machine similar to the cylinder paper machine described below. It is usually sold in a moist state. Paper containing ground wood turns yellow when exposed to the light and becomes brittle. A solution of sulphate of aniline turns ground-wood fibre a bright yellow, the intensity of the color giving a rough guide to the percentage of ground wood in the paper.

The origin of the ground-wood process has been the source of much discussion. The most authentic works give credit to Herman Keller, who while walking in the woods was attracted by a bees' nest. Analysis of the material from which the nest was made led him to believe that

it was paper made from mechanically isolated wood fibres. His later experimental work proved his theory to be correct.

Chemical Wood Pulp. The oldest process of freeing cellulose from the incrusting woody matter, producing a material for making white paper, is the soda process, patented by Watt and Burgess in England in 1854. A soft wood—usually poplar in America, pine in Europe—is barked, chipped across the grain into small pieces, and cooked under steam pressure with a solution of caustic soda. The alkali dissolves everything but the cellulose, and after washing and bleaching a soft white fibre of good quality is produced, of little strength, but very useful to supplement other fibres.

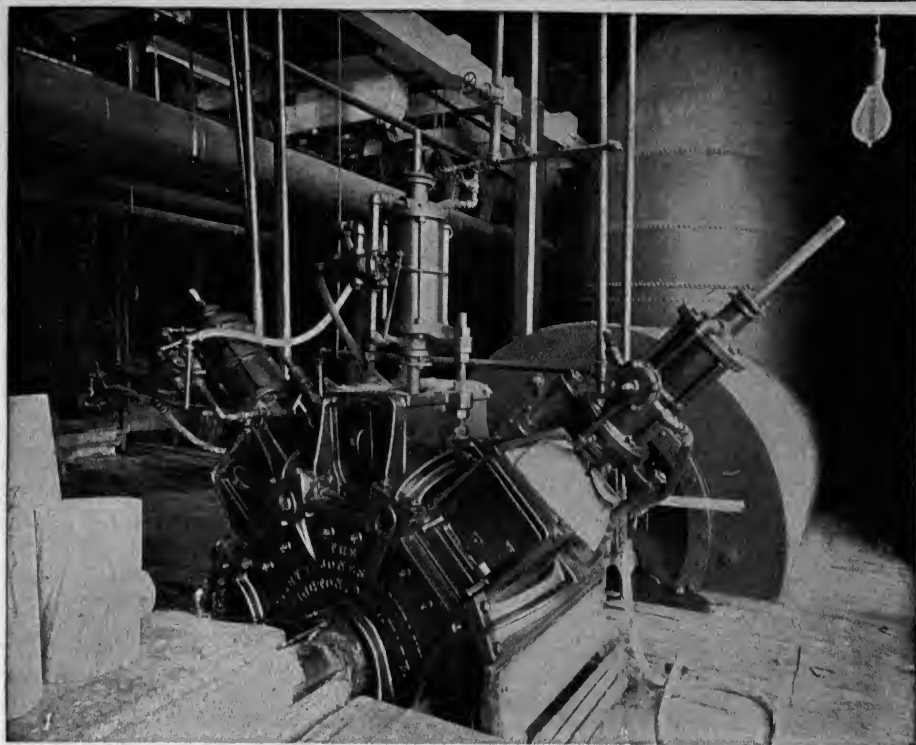
The *sulphite process* is apparently an American invention, the first patent being granted in 1867 to B. C. Tilghmann. He used sulphurous acid to produce pure cellulose, and while this is the base of the modern process, it was not brought to a practical success till bisulphite of magnesium or calcium was used instead. Mitschelich in Germany brought the process to a commercial basis, and of late years it has developed to very large proportions. Various modifications of the process are used, but in all of them the wood, properly barked, chipped, and dusted, is digested under steam pressure in a solution of the bisulphite, washed, and bleached if necessary. Sulphite fibre has good strength and color, and much of it is used unbleached.

The *sulphate process* is much used in Sweden for making a very strong pulp, widely used in making tough board and wrapping papers. It is similar to the soda process in theory, but sulphate of soda is used. It was objectionable to American manufacturers because of the offensive odor arising from its by-products and hence has not become widely used in American mills. The pulp became very popular with paper manufacturers about 1905, when it was introduced as a valuable substitute for manila stock, which was too high in price to be practicable for the average wrapping paper. Large quantities are now imported by American manufacturers annually. A great advantage with this process is that much of the saw-mill waste can be utilized and the fibres of many kinds of wood can be isolated to better advantage than in any other chemical process.

In the different processes of treating wood various forms of boilers are used—stationary, rotary, cylindrical, and spherical. They have to be lined to resist the action of the chemicals, and lead or cement is commonly used for this purpose. A large factor in the successful conduct of pulp manufacture lies in recovering the chemicals from the spent liquor. In the soda process the liquor is evaporated and finally incinerated in a furnace from which nearly all the caustic soda used is recovered. There are similar economies practiced in the other processes, which not only save valuable chemicals but prevent the pollution of streams.

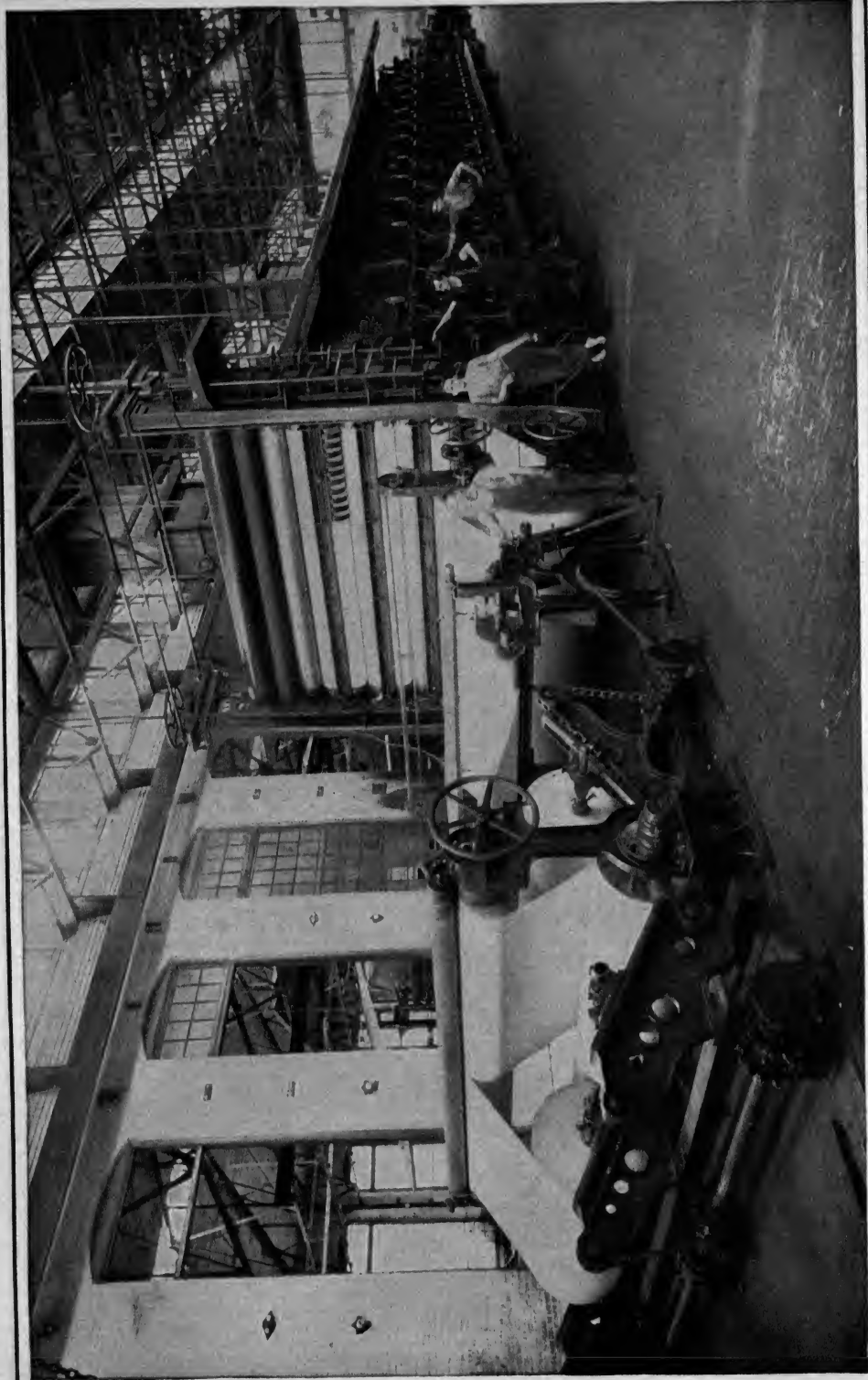
New Sources of Pulp. The rapid destruction of the forest lands of America and Canada for the purpose of paper making has caused a scientific movement for the conservation of the wood supplies. This action has brought about a study of new paper-making supplies. Experiments have resulted in the practical utilization of many kinds of wood besides spruce, poplar, and hemlock. Saw-mill waste has been widely

PAPER-MAKING MACHINERY



1. WOOD-PULP GRINDER AT RUMFORD FALLS MILL OF INTERNATIONAL PAPER CO.
2. BEATING ENGINES IN RUMFORD FALLS MILL

PAPER-MAKING MACHINERY



PAPER MACHINE AT MILL OF INTERNATIONAL PAPER CO., RUMFORD FALLS, MAINE

used. Cornstalks have been found to be practical as a paper stock, and a mill in Georgia is now turning out paper with this stock.

The Cylinder Machine. While almost all paper, ordinarily so called, is made on the Fourdrinier machine, a very large class of heavy papers, cardboards, strawboard, news board, binders' board, and the like, as well as most tissue paper, is made on a different machine. Instead of the horizontal wire on which the pulp flows, the wire is fastened around a cylinder which dips in a vat of pulp, and as it revolves a film of pulp comes up with it, the water running off through the wire. As there is no lateral shake, the paper is not felted as well as on the other machine and has less strength across the web. It is easy to arrange several vats and cylinders so that the sheets shall unite, and in this way very heavy boards are made. The rest of the machine, press rolls, driers, etc., is the same as described previously. While, as already stated, the product of the cylinder machines is not so important, there are in the United States nearly as many of these in operation as Fourdrinier machines.

Coated Papers. A large amount of paper is given a surface coating of various substances after it leaves the paper mill proper. The process of coating is as follows: The paper is fed in a continuous roll to a rotary brush which applies the coating on one side. Other brushes spread the material evenly, and it is then hung from sticks in festoons in a steam-heated room. The sticks rest on moving racks which pass the festoons slowly down the room. When dry the paper is rewound and calendered, glazed, or embossed. If it is to be coated on two sides, it is passed through the machine a second time and the other side coated. A patented process for coating both sides at once is in use, but is only suitable for a cheap product.

Coated book paper (used for illustrations of the better sort where a very smooth surface is needed to reproduce every line and shading of the picture) is coated with clays and glue or casein, and the necessary smoothness obtained by calendering in a machine similar to the super-calender described above, but having compressed cotton rolls in place of paper ones. Lithographic paper is usually coated on one side only and is used for printing from stones. See LITHOGRAPHY.

Glazed papers are chiefly used for covering paper boxes. They are coated on one side only and given a very high glossy surface by the *friction calender*. This consists of a top roll of polished iron heated by steam revolving at a much higher speed than the roll below, which is made of compressed cotton. The paper as it passes between these rolls is smoothed as if a hot iron were passed over it. Colors are given to the coating, various pigments being mixed with the clay; and the high lustre is obtained by using beeswax or carnauba wax in the coating mixture. Many other fancy effects are obtained by coating and embossing paper.

Wall paper is printed in various colors and designs from paper in the roll and is often embossed. See WALL PAPER.

Manila Paper. Originally the wrapping paper called manila paper was made of manila hemp, jute, old rope, and other substances having a strong fibre. Since the introduction of sulphite fibre the ordinary manila wrapping paper of commerce is made wholly of wood,

while the strong paper made of old rope and other strong materials is called rope manila.

Kraft Paper. Owing to the high price of manila stock and the lack of strength in the sulphite papers, a sulphate paper was introduced into America from Norway about 1908. This is a dark-brown paper that is very tough, having a hard finish. It is used extensively in making heavy sacks for grain and flour. Bags for the covering of carriages and automobiles have also been made from this paper. By being rolled in narrow strips, a successful twine has been produced with kraft paper. As a commercial wrapping paper it has almost entirely displaced the pure manila product.

Paraffin Paper. In making paraffin paper a machine is used which consists essentially of a container for molten wax or paraffin, which is kept at a uniform temperature by some suitable heating device (in the case of pure paraffin, a solvent such as benzol is frequently used); a glass rod placed practically in the centre of this container, horizontally and parallel with the spool on which the paper is rolled; a steel scraper, and two porcelain rollers. The paper is led from the roll on which it is mounted through the enameled iron trough which contains the molten wax. On being drawn through the trough, the paper is guided by the glass rod which, by its smooth surface, prevents excessive accumulation of wax on the upper surface of the paper and also keeps the paper evenly distributed in the molten wax. Upon leaving the trough, the undersurface of the paper comes in contact with a steel scraper. The surplus wax is thus removed from the undersurface before the paper passes through the two porcelain rollers which act as a wringer and drain out all the surplus wax and also give the paper a uniformly smooth surface on both sides. The paper is then allowed to fold loosely and hang until it dries, when it is ready to be cut into sheets.

Classification. Papers may be classified as follows: 1. *Writing papers*, comprising bond papers, ranging from the best bank-note and stock-certificate to greatly inferior grades, bond in nothing but name; ledger papers, for book-keeping and other fine writing purposes; linen papers, usually with rough surface and laid watermark. Writing papers are known in the trade as flat papers, as opposed to printing papers, which used to be folded in quires, but now are also flat and almost never folded. 2. *Book papers*. 3. *News paper*, usually largely made of ground wood. 4. *Wrapping paper*, rope manila, manila, bogus manila, etc. 5. *Tissue, blotting paper* (unsized), *cover papers*, etc. 6. *Boards* of all sorts, strawboard, box board, news board (made from old printed newspapers), bristol board, etc. (See STRAW, PAPER AND OTHER MANUFACTURES OF.) Pulp is also waterproofed and pressed into rails and many other shapes. It is used for the inside of car wheels.

Sizes. Formerly very many names were in use to designate different sizes of papers, but now they are largely obsolete, especially in America, and standard sizes are being more and more superseded by special orders of odd sizes. The names for the sizes of writing papers are largely the same in the United States and in England, but the sizes differ slightly. A few of the most common are given on the next page, with the sizes of both countries:

NAMES	In United States	In England
Cap	14 × 17	
Demy	16 × 21	
Folio	17 × 22	
Medium	18 × 23	22 × 17½
Double cap	17 × 28	24 × 19¼
Royal	19 × 24	27 × 19¼
Super royal	20 × 28	30 × 22
Imperial	21 × 31	34 × 26
Atlas	26 × 33	40 × 27
Double elephant	26 × 40	

Statistics. In America the tendency has been to combine the pulp and paper mills under a single organization. The census figures of 1909 show that there were in this industry 777 separate mills, of which only 81 were devoted exclusively to the manufacture of pulp. There were 538 which made paper exclusively. Since that census a considerable number of mills making paper alone have built pulp mills. The reason for this change has been largely due to changes in the transportation rates of wood pulp and pulp wood, resulting in added expense for the purchaser of finished pulp. This problem of transportation has also tended towards the elimination of the mill-manufacturing pulp exclusively, as all profits are rapidly dwindling. Since the census several new paper mills have been erected, and others have added new machines materially increasing their output. Together with the new plants and additional paper machines the production of the American mills now equals that of all other countries combined. In 1909 America produced 48.53 per cent of the entire world production. The investment in the paper and pulp industry in America now exceeds \$430,000,000. More than 82,000 persons are employed in the industry, of whom 76,000 are wage earners. The value of all products exceeds \$270,000,000 a year.

In 1909 Congress enacted a Tariff Act materially reducing the duties on paper-making materials and on finished paper. As much of the American trade had grown under a high protective tariff, this change had a material effect on the domestic manufacturer, who had to meet severe competition from Canadian and European mills. In 1913 all paper valued at less than two and one-half cents a pound, which meant newsprint paper, was put on the free list. All wood-pulp and crude-paper stock was also admitted free of duty by the terms of the new Act. Under the Act of 1909 the imports of newsprint were 12,229 tons in 1911. Capital was promptly invested in Canada for the utilization of the enormous forest resources for paper manufacturing, and in 1913 the Canadian mills exported 192,852 tons of newsprint paper, valued at \$7,484,318, to the United States. Under the free tariff of 1913 the Canadian exports to the United States increased to 315,476 tons, valued at \$12,189,792, or practically the entire production of the Canadian mills. The forest conditions in Canada lead many to believe that the newsprint industry will eventually move to that country. American mills produce about 1,200,000 tons of newsprint annually, but the inroads made by Canada in a single year are indicative of an economic revolution in paper manufacturing.

Bibliography. Griffin and Little, *Chemistry of Paper Making* (New York, 1894), Schu-

bert, *Die Praxis der Papierfabrikation* (Berlin, 1898); Blanchet, *Essai sur l'histoire du papier et de sa fabrication* (Paris, 1900); Cross and Bevan, *A Text Book of Paper Making* (London, 1900); Schubert, *Die Papierverarbeitung* (Berlin, 1900-02); Beveridge, *Paper Maker's Pocket-book* (London, 1901); Watt, *The Art of Paper Making* (ib., 1901); Clayton Beadle, *Chapters on Paper Making* (5 vols., New York, 1904-07); Stanislas Gagne, "Mechanical Wood Pulp," in Canadian Society of Civil Engineers, *Transactions*, vol. xviii, part ii (Montreal, 1905); George Clapperton, *Practical Papermaking* (London, 1907); L. E. Andés, *The Treatment of Paper for Special Purposes*, English translation by Charles Salter (ib., 1907); R. W. Sindall, *The Manufacture of Paper* (New York, 1908); United States Forest Service, *Wood Pulp Reports* (Washington, 1908), section on "Paper and Pulp," in *Thirteenth Census of the United States*, vol. x, Manufactures, part iii (ib., 1909); Sindall and Bacon, *The Testing of Wood Pulp* (London, 1912); A. J. and G. Martin, *Industrial and Manufacturing Chemistry* (New York, 1913); E. A. Dawe, *Paper Testing* (London, 1914); id., *Paper and its Uses* (ib., 1914); Stanislas Gagne, *Pulp and Newspaper Manufacturing* (Montreal, 1914).

PAPER BOOK. In English law, a book containing copies of all the pleadings and an abstract of all the facts necessary to a complete understanding of a case. A paper book is only required to be filed with the court where the facts are agreed upon or have been determined and the question remaining for decision is one of law only. Where the argument is before a court of original jurisdiction, the facts must have been agreed upon or admitted by the pleadings. Where a case is appealed, the paper book corresponds to what in the United States is usually called the appeal book or case and exceptions. See APPEAL, CASE, PLEADING; PRACTICE.

PAPER HANGINGS. See WALL PAPER.
PAPER NAUTILUS, or **PAPER SAILOR.** The shell of the argonaut (q.v.).

PAPER OFFICE, THE. In Great Britain, the branch of the Public Record Office in which state papers are preserved. It originated in a decree of Queen Elizabeth, who in 1578 established "the Office of Her Majesty's Papers and Records for Business of State and Council." Thirty years later James I. by letters patent under the great seal definitely established the office in the palace of Whitehall. In 1852 the State Paper Office was by an order in council made a branch of the Public Record Office (q.v.).

PAPER PLANT, EGYPTIAN. See CYPERUS; PAPHYRUS.

PAPER SKIN. See LUNGWORM.

PAPER WEDDING. See WEDDING ANNIVERSARIES.

PAPHLAGONIA (Lat., from Gk Παφλαγονία). In ancient geography, a district of northern Asia Minor, bounded on the north by the Black Sea, on the east by Pontus, from which it was separated by the river Halys, on the south by Galatia, and on the west by Bithynia (Map: Rome, F 2). The inhabitants were akin to the Thracians and seem to have preserved a large degree of independence, though recognizing the suzerainty of Lydians, Persians, and Macedonians. Later the country was joined to Pontus and after the Roman conquest was divided between the provinces of Bithynia and Galatia.

It was organized into a separate province towards the end of the third century of the Christian era. The cavalry of the country was famous, and the mountains furnished abundant timber and some metals. The chief city was the Milesian colony of Sinope (q.v.), on the Black Sea. Consult W. M. Ramsay, *Historical Geography of Asia Minor* (London, 1890).

PA'PHO, or **PA'PHOS** (Lat., from Gk. Πάφος). The ancient name of two cities on the southwest coast of Cyprus. The older city, sometimes called Palaipaphos (now Kuklia), was situated about a mile and a quarter from the coast. It was probably founded by the Phœnicians and was the centre from which the worship of Aphrodite spread over the island. Remains of the wall surrounding the temple of the goddess still exist. In Greek legend the goddess was said to have risen from the sea at this point, and even in the Homeric poems it is mentioned as her favorite abode. The form of the shrine of the goddess on Roman coins is strongly reminiscent of the Mycenaean period and points also to the early date of the sanctuary, which was a place of pilgrimage until the overthrow of paganism. The other Papho, called Neopaphos (now Baffo), was on the seacoast, about 7 or 8 miles northwest of the older city, and was said to have been an Arcadian colony. Under the Romans it was the capital of the island and the official residence of the Governor. Consult Oberhummer, *Die Insel Cypren* (Munich, 1903).

PA'PIAS (Lat., from Gk. Πάππας). Bishop of Hierapolis in Phrygia. He flourished during the first half of the second Christian century, but the dates of his birth and death are unknown. He is said by Irenæus to have been a companion of Polycarp and "a hearer of John," but this last is often regarded as incorrect. He wrote in Greek an important work, in five books, entitled *Expositions of the Oracles of the Lord*, which unfortunately has been lost. A few fragments, preserved chiefly by Irenæus and Eusebius, indicate that the work was not itself a gospel, but a sort of running commentary on the sayings (and deeds?) of Christ. They also prove that written gospels already existed. Papias diligently gathered up the primitive Christian traditions, setting a high value upon every direct line of testimony concerning the Lord's teaching.

Eusebius credits Papias with more learning than judgment, which probably means that he disliked his materialistic notions of the approaching millennium, with its alleged miraculous vintages and crops. (Cf. Irenæus, *Against Heresies*, v, 33.) These conceptions, however, were not displeasing to Irenæus and other early Christians, although they were generally discarded before the fourth century. In any event, Papias' reputation does not depend upon his millenarian views. He stands as a connecting link between the Apostolic age and that of the Apologists, a period where our sources at best are scanty and each one correspondingly valuable. He is of especial interest because of his preservation of traditions regarding the gospels of Matthew and Mark (qq.v.).

Bibliography. The fragments of the *Expositions* may be consulted in Lightfoot's *Apostolic Fathers*, edited by Harmer (London, 1893), or in Funk, *Patres Apostolici* (Tübingen, 1901). Consult also: C. L. Leimbach, *Das Papiasfragment* (Gotha, 1875); J. B. Lightfoot, *Essays on Supernatural Religion* (2d ed., London, 1893);

B. F. Westcott, *History of the Canon of the New Testament* (7th ed., ib., 1896); Adolf Harnack, *Geschichte der altchristliche Literatur*, ii (Leipzig, 1897); C. T. Crutwell, *Literary History of Early Christianity* (2 vols., New York, 1899); Theodor Zahn, *Forschungen*, part vi (Leipzig, 1900); B. W. Bacon, *The Fourth Gospel* (New York, 1910).

PAPIER-MÂCHÉ, pâ'pyá-mâ'shâ' (Fr., pulped paper). A tough, plastic material, made from paper pulp, or from paper that has been reduced to a pulp, mixed with glue, paste, oil, resin, or other sizing. It has been in use for more than a century in Europe, and it is not improbable that it was first suggested by some of the beautiful productions of Sind and other parts of India, where it is employed in making boxes, trays, etc., as well as in China and Japan. Its first application, so far as we know, was to the manufacture of snuffboxes, by a German named Martin, in 1740. Properly speaking, papier-mâché is paper pulp molded into shape, and it has been used not only to make small articles, such as boxes, trays, etc., but in the interior decoration of houses for cornices, ceilings, etc. From the extension of the application of papier-mâché to the manufacture of a number of light and useful articles, modifications have taken place in its composition, and it is now of three kinds—first, the true kind, made of paper pulp; second, sheets of paper pasted together after the manner of pasteboard, but submitted to far greater pressure; and third, sheets of thick millboard cast from the pulp, which are also heavily pressed.

PAPIL'ION'IDÆ. A family of large butterflies. See SWALLOWTAIL.

PAPILLA (Lat., nipple). A term applied by anatomists to one of several minute, elongated, conical processes, projecting from the surface of the true skin into the epidermis, highly vascular and nervous in their character, and taking an active part in the sense of touch. Their form and structure are described in the article SKIN. The term "papilla" is also used to designate the optic disk or nerve head as observed through the ophthalmoscope. See OPHTHALMOSCOPE.

PAPILLO'MA (Neo-Lat., from Lat. *papilla*, nipple + *-oma*). A new growth somewhat resembling a normal papilla and appearing either on the skin or mucous membrane or at the mucocutaneous junction. The term is loosely applied to warts, corns, and certain nævi. The hard form contains much dense connective tissue and few cells and grows chiefly upon the skin. The soft form appears on mucous membranes and is seen typically in the larynx, bladder, rectum, and uterus. See TUMOR.

PAPIN, pâ'pân', DENIS (1647-?1712). A French physicist. He was born Aug. 22, 1647, at Blois, where, after studying medicine, he practiced for some time as a physician. His devotion to study and research in physical science dates from his acquaintance with Huygens, and he soon after became the pupil and assistant of this famous physicist, contributing substantial improvements to the air pump. He rapidly acquired a wide reputation and visited England, where he was received with open arms by the philosophers of that country, and became a member of the Royal Society in 1680. While in England, Papin and Robert Boyle worked together and performed many experiments, Papin inventing the double air pump and the air

gun during this period. To him is also due the idea of pneumatic transmission of power, but he was not able to make a practical use of his method. In 1687 Papin was called to the chair of mathematics in the University of Marburg in Hesse-Cassel, the duties of which office he discharged with zeal and success for many years. He died sometime between 1710 and 1714, very poor and in complete obscurity. To Papin belongs the high honor of having first constructed a steam engine with a piston (1690), and he also used the simple method of condensing the steam to produce a vacuum beneath the raised piston. He is also the inventor of the safety valve, which was an essential part of his digester (q.v.). With this latter machine Papin showed that liquids under reduced atmospheric pressure would be made to boil at a much lower temperature than when freely exposed to the air. Papin discovered the principle of action of the siphon, improved the air pump of Otto von Guericke, and took part in philosophical discussions with Leibnitz. In 1690 he constructed a paddle-wheel boat in which his pumping engine was used to raise water which turned a water wheel connected with the paddle. It was destroyed by a mob on account of its interfering with the business of the boatmen. Many of Papin's numerous writings will be found in the *Philosophical Transactions, Acta Eruditorum*, and the *Recueil de diverses pièces* (1695). He published an explanation of the construction and uses of his digester (London, 1681), afterward (1682) translated into French, and his experiments entitled *Nouvelles expériences du Vuide* (Paris, 1674; reprinted, Paris and Blois, 1869). It was not for nearly a century after his death that the great value of Papin's experiments and researches was perceived. For Papin's work connected with the steam engine, consult Thurston, *Growth of the Steam Engine* (New York, 1878); for his life, E. Gerland, who gives also his correspondence with Leibnitz and Huygens (Berlin, 1881); for brief descriptions of some of his machines, Gerland and Trau-müller, *Geschichte der physikalischen Experimentierkunst* (Leipzig, 1899).

PAPINEAU, pá'pé'nó', LOUIS JOSEPH (1786-1871). A Canadian orator and political agitator. He was born at Montreal, Oct. 7, 1786, received his education at the Seminary of Quebec, subsequently studied law, and was admitted to the bar in 1810. In 1809 he was elected to represent the constituency of Kent in the Legislative Assembly of Lower Canada and in 1811 was chosen to sit for one of the districts of Montreal. During the War of 1812 he was the commander of a company of militia, but saw little active service. In 1815, as the leader of the French-Canadian party, he was chosen Speaker and continued to hold that position until 1837. He had frequent conflicts with the royal governors, and in 1827 Lord Dalhousie refused to accept him as Speaker, but the Assembly insisted, and Dalhousie resigned. In an effort to force the home government to make the Provincial Council elective instead of appointive, the Assembly under his lead refused to grant supplies to the Governor and in 1834 transmitted to England the famous Ninety-two Resolutions. Affairs now became more and more critical, and in 1835 Papineau arranged with William Lyon Mackenzie, the leader of the Revolutionary party in Upper Canada, for coöperation between their followers. In March, 1837, the English government finally

declared that an elective council could not be granted and authorized the Governor, since the Assembly still refused to vote supplies, to use the money in the treasury. A proclamation was issued warning the people against agitators, and, because of Papineau's violent harangues to the people, he was deprived of his captaincy in the militia. In October, 1837, he attended at St. Charles a meeting of delegates from the counties of Lower Canada which decided upon revolution, though there has been much dispute as to whether he favored this action. Certain it is, however, that when the rebellion, the way for which he had prepared, broke out, he fled to the United States, where he remained for two years. He then went to France, but in 1847 took advantage of a general amnesty and returned to Canada. He was soon afterward elected to a seat in the Lower House of the now united Canadian Parliament, but found that his old influence had departed. He retired from the public service in 1854 and spent the remainder of his life in seclusion at his residence of Montebello on the Ottawa River. He died Sept. 24, 1871. Consult: William Kingsford, *History of Canada* (Toronto, 1887-98); Robert Christie, *History of the Late Province of Lower Canada* (Quebec, 1848-55); D. B. Read, *The Canadian Rebellion of 1837* (Toronto, 1896); A. D. De Celles, *Papineau-Cartier* (ib., 1904).

PAPINI, pá-pé'né, GIOVANNI (1881-). An Italian philosopher. He was born at Florence, where he founded the review *Leonardo*, which he edited and for which he wrote under the pen name of Gian Falco. He contributed to many other periodicals and is author of *Il crepuscolo dei filosofi*; *La coltura italiana*, with Prezzolini; *Il tragico quotidiano: favole e colloqui* (1906); *Il pilota cieco* (1907); *L'Altra metà: saggio di filosofia mefistofelica* (1911); *Le memorie d'Iddio* (1911). William James characterizes Papini as the leader of Italian pragmatism, who "grows fairly dithyrambic over the view that it [pragmatism] opens of man's divinely creative function."

PAPINIANUS, ÆMILIANUS. A Roman jurist, a contemporary, friend, and trusted adviser of the Emperor Septimius Severus. He was probably of Syrian-Greek origin, was born about 146 A.D., became praetorian prefect or Chief Justice of the Empire in 203, and was put to death in 212 because (it is said) he refused to justify Caracalla's murder of Geta. He was the greatest of the Roman jurists. More than any other, he strove to keep law in harmony with ethics. In Valentinian's Law of Citations (426) that Emperor directed that if an equal number of authorities were produced on either side of a disputed question the opinion supported in Papinianus' writings should prevail. Both before and after Justinian's time the works of Papinianus formed an important part of the third year of legal study, and the students of that year were called Papinianistæ. His principal published works were digests of decisions: 37 books of "questions" and 19 of "responses." Because he left no systematic commentaries, Justinian's codifiers drew less largely on his writings than on those of Ulpian and Paul, but excerpts from his works constitute an important part of the Digest. Outside of the Digest we have a passage from Papinianus which was included in the Breviary of Alaric (q.v.) and a few fragments of his responses found in Egypt in 1877 and 1882. These have been printed by

Huschke. Consult Otto, *Papinianus* (2d ed., 1743), and the article "Æmilius, 22," in Friedrich Lübker, *Reallexikon des Klassischen Altertums*, vol. i (8th ed., Leipzig, 1914); E. Manson, *Great Jurists of the World* (Boston, 1914).

PAPINIUS STATIUS, PUBLIUS. See STATIUS, PUBLIUS PAPINIUS.

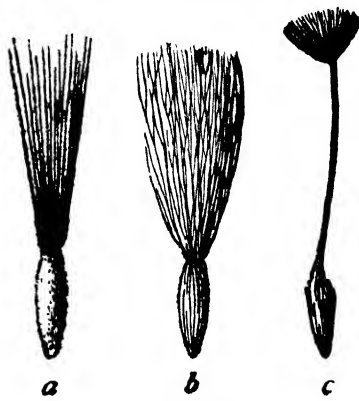
PAPIRIVS, LUCIUS, surnamed CURSOR from his swiftness of foot. A Roman general. He was appointed dictator to carry on the second Samnite War in 325 B.C., but treated his soldiers so harshly that at first they allowed themselves to be defeated. Later he won their good will, and captured the town of Luceria. When the Samnites again revolted in 309 B.C., Cursor was, for a second time, appointed dictator, and won a decisive victory at Longula, for which he was granted a triumph. Cursor was chosen consul five times. His son of the same name completed the subjection of the Samnites (272 B.C.).

PAPIST PLOT. See OATES, TITUS.

PAPPENHEIM, pāp'pen-him, GOTTFRIED HEINRICH, COUNT (1594–1632). One of the leading Imperialist generals in the Thirty Years' War. He was born at Pappenheim, Bavaria, May 29, 1594, of an old and distinguished Swabian family. He studied at Altdorf and Tübingen and early identified himself with the Catholic cause. He served under the Poles against the Russians and Turks, was in the service of the Catholic League in 1620, and at the battle of the White Hill in the same year contributed greatly to the victory over the Bohemian forces. He was in 1623 made commander of the mounted regiment which became famous as Pappenheim's cuirassiers, or Pappenheimers. He was a cavalry commander in the Spanish service in Lombardy in 1625–26, but rejoined the Imperialist army in the following year, suppressed a revolt of the Protestant peasants of Upper Austria, and then was engaged under Tilly in the campaigns against the Danes, Swedes, and Saxons. He took a prominent part in the storming of Magdeburg (1631) and was engaged at Breitenfeld (1632). Although he covered the retreat of the defeated army in a masterly fashion, the defeat was largely due to his foolhardiness on the battlefield. He served under Wallenstein in the final campaign against Gustavus Adolphus. Just before the fateful battle of Lützen he had been detached with eight regiments for an independent movement, but a recall was sent after him when the rapid advance of the Protestant leader became known to Wallenstein. His splendid charge on the left wing of the Swedish army had almost changed the result when he was mortally wounded. He died the next day at Leipzig, Nov. 17, 1632. Consult Hess, *Gottfried Heinrich, Graf zu Pappenheim* (Leipzig, 1855).

PAPPUS (Neo-Lat., from Gk. πάππος, down, from *páppos*, pappos, grandfather, from *páppas*, pappas, father, papa). The peculiar calyx of the Compositæ. The flowers are placed close together in the flower head. As a consequence, the sepals are not necessary for protection and for mechanical reasons are probably prevented from developing in a normal way. Moreover, the flowers are epigynous, so that the sepals are developed from the top of the seedlike fruit (achene, q.v.). In many cases the sepals (pappus) are entirely obsolete, in others they form a shallow cup or crown, in others they are arranged as teeth or scales, while in still others they constitute a tuft of bristles (a) or hairs (b). It is this last form of pappus which, as in

the dandelions, thistles, etc., is a conspicuous character of the family. The hairlike pappus is exceedingly diverse in details of structure, in some cases being coarse and bristly, others soft and silky, and others beautifully plumose. In



ACHENES.

a, *Artemisia*; b, *Sonchus*, or sow thistle; c, *Taraxacum*, or dandelion.

the dandelion (c) the achene develops a long beak at the summit of which the tuft of soft pappus hairs occurs. In case the pappus has any special development it is associated with the dispersal of the seeds. For example, the hairy pappus of thistles and dandelions enables the fruit to be carried by currents of air, while the toothed and even barbed pappus of Spanish needles serves as a grappling appendage by which the fruit may lay hold of animals brushing past.

PAPPUS, or **PAPPUS** (Lat., from Gk. Πάππος) (c.300 A.D.). An Alexandrian mathematician. He is said to have written on geography and astrology, to have composed a commentary on the *Almagest* of Ptolemy, and to have been the head of a school. His principal work, however, was the *Μαθηματικὰ Συναγωγαί* (*Mathematicæ Collectiones*) in eight books, the first and half of the second of which are lost. To this work we owe much of our knowledge of Greek mathematics, and the translation of six of these books into Latin by Commandino (1588) had a powerful influence on the renaissance of geometry in the seventeenth century. In particular, the geometry of Descartes had for one of its principal objects the solution of a problem of Pappus, viz., given $2n$ straight lines, to find the locus of points such that the product of the distances of each of these to n of the lines (or more generally of straight lines at given angles to the n lines) shall have a given ratio to the product of the distances (or lines at given angles) to the other n . Pappus was the last of the great Greek mathematicians, but the value of his work is largely due to the fact that it gives to us numerous extracts from the lost writings of his predecessors. The most important theorem due to him is the one often called by Guldin's name, viz., the volume of a solid of revolution is equal to the product of the area of the revolving plane figure and the length of the path of its centre of gravity. Numerous minor propositions bear his name, such as the Pythagorean theorem as generalized for an oblique-angled triangle, in which the squares on the sides are replaced by parallelograms. The text

of Pappus has been edited by Hultsch (3 vols., Berlin, 1876-78, Greek and Latin).

PAPRIKA, pǎ'pré-ká (South Slavic, pungent). 1. A condiment derived from one or more of the less pungent peppers of the genus *Capsicum* (q.v.). 2. The name of the peppers yielding the condiment. The original pungent, highly colored, and very aromatic paprika of Hungarian origin is prepared from the whole pod, including the seeds and placentæ. In the American trade, however, paprika frequently refers to a condiment prepared from the walls of the pod alone. Another form of paprika, often called Spanish paprika, is made from a highly colored, nonpungent sweet pepper of Spanish origin.

Consult Young and True, "American Grown Paprika Pepper," in United States Department of Agriculture, *Bulletin No. 43* (Washington, 1913).

PAPUA, pǎ'pōō-ä or pǎp'û-ä, TERRITORY OF. The British possessions in the southeastern part of the island of New Guinea (q.v.) with islands between lat. 8° and 12° S., and long. 141° and 155° E. (Map: East Indies, K 7). The islands, which include the D'Entrecasteaux Archipelago and the Louisiade group, have an area of 2754 square miles. The mainland area is 87,786 square miles. The latter adjoins on the west the Dutch territory and on the north Kaiser Wilhelms Land. The Territory of Papua extends from east to west upward of 800 miles, and about 200 from north to south towards either end, but is only about 50 miles deep behind Freshwater Bay, near the middle of the portion of the colony that is situated on the island of New Guinea. The total coast line of the possession has been computed at 3664 statute miles, 1728 on the mainland and 1936 on the islands. The territory has been a part of the British dominions since 1888, and since Sept. 1, 1906, it has been administered as a territory of the Australian Commonwealth. The Great Australian Barrier Reef can be traced around the Gulf of Papua and along the southeast coast, including the islands of Kiriwana, Nada, and part of Murua; most of the islands, however, are mountainous and principally of schistose formation, the highest, Goodenough, 8000 feet. The eastern of the mainland part of the colony is also mountainous, and as the mountains extend westward they rise and coalesce to form a massive central chain which attains its highest altitude in the Owen Stanley Range, the highest point of which is Mount Victoria, 13,121 feet, and in Mount Scratchley, the Wharton Range, and Mount Albert Edward, the latter about the same height as Mount Victoria. Farther west the main range becomes more broken and lower, while pursuing nearly the same general trend towards the northwest as it had in the more western part of the colony. The western end of the possession is for 300 miles generally low and swampy until a long distance from the coast is reached. On the Fly River near the junction of British, Dutch, and former German territory, there are limestones with fossil corals, and these are also met with at many other places in the low and swampy regions of the western end of the colony and elsewhere, and the stagnant waters breed fever-bearing insects, so that at present it is dangerous to live along the coasts. The whole possession is remarkably well watered. The great mountains and by far the larger portion of the lower country are all covered by forest.

The great majority of the principal rivers open into the Gulf of Papua. The two largest are the Fly and Purari. The Fly spreads out its head branches over a large area in the centre of the island, comprising considerable portions of the three different territories. Its course is about 620 miles from the sea to the British-German boundary. It is navigable by steam launch for over 500 miles and for 600 miles in small boats. The Purari is navigable for 120 miles.

Climate. The climate of the lower part of the country is warm. At Port Moresby, the seat of government, which is situated near the middle of the colony, the average annual temperature is about 80° F., the average maximum is about 86° F., and the minimum about 75° F. The hot season is from November to May, the hottest months being January and February; the cold season is from June to October, the coldest month is August. During the hot season winds on the south coast are from the north and west and are unsteady; during the cold season they are from the southeast and are much more regular. The rainfall at Port Moresby during 1912-13 was 41.05 inches. It is much greater, but undetermined, on the central mountain ranges. On the south coast the climate is rather comfortable than oppressive during the cold season; it is generally agreeable at an altitude of 3000 feet, a height that can be reached in one day from Port Moresby, and at 13,000 feet ice forms.

Fauna and Flora. There are no dangerous wild beasts in the colony; wild swine are common; there are several varieties of wallaby, phalanger, echidna; there are no deer, hares, or rabbits. The most dangerous creature is the crocodile; many lives are lost each year through these amphibians and by snake bite. The snakes are nearly related to those of Australia, although a number are peculiar to the island. The birds, of which there are over 500 species, include the cassowary, many birds of paradise, a great variety of pigeons, the hornbill, the black and white cockatoo, geese, many species of ducks, quail, snipe, woodcock, plain turkey, and plain hens.

The flora is as varied as the climate. On the tops of the highest mountain chains there are many species of grasses, several kinds of buttercup, forget-me-nots, daisies, rhododendrons, heaths, and other flowers of temperate climates. The forest there is principally cypress; from 7000 to 10,000 feet it is chiefly myrtaceous, often covered by trailing bamboo or mixed with pandanus. From 2000 to 5000 feet the evergreen oaks are common. On the lowlands there are several varieties of hardwood trees—afzelia, bijuga, calophyllum, etc. In general the interior contains the dense forests, while the shores have in many places grass lands dotted with eucalyptus trees. Native cloth is made by beating out the bark of the paper mulberry, of the breadfruit tree, or of certain trees of the nettle family. Fibre is obtained from the banana, the coconut, from the bark of many saplings, and the best of all from the aerial roots of certain species of pandanus. Most of the trees and flowers that are met with in the tropical islands of the Pacific or in north Queensland occur also in Papua.

The climate is favorable to the cultivation of all tropical products. The coconut palm bears well everywhere and is common along the coast

line, but in the far interior it is not met with. It is being extensively planted every year. Cotton would be specially suited to the climate of the central district. Tobacco and sugar cane seem to be indigenous. There are several native trees and plants that yield good classes of rubber, also some good varieties of timber, including sandalwood, ebony, and cedar, in most cases easily accessible by river. Tea, coffee, and cocoa thrive well, but are not indigenous; the latter has been introduced and propagated free of disease and does not seem to have any special local enemy. The climate is very congenial to rice and maize and all kinds of tropical fruit. The marine resources comprise pearl shell and pearls, trepang, sponges, and turtle shell.

People. Racially the natives of Papua belong to at least two indigenous types, the Pygmy and Papuan. In addition we have to deal with relatively recent Melanesian immigrants into both German and British New Guinea, where they have, generally speaking, ousted the autochthonous Papuans from islands and coastal districts. In a broad classification Melanesian and Papuan would have to be classed as subdivisions of a single race. Both are essentially frizzly-haired, but among the Melanesians curly and even wavy hair is not uncommon. The Papuan has a higher and longer head (index, 76-77), with stronger development of brow ridges, more retreating forehead, and a longer, stouter, and more decidedly arched nose; the color of his skin is darker, ranging from a dark chocolate to a sooty brown. The stature of the Papuans varies considerably in different regions. Measurements at Wakatimi and Parimau, Dutch New Guinea, by Wollaston yielded an average of about 167 (5 feet, 6 inches); in German New Guinea Neuhauss found the mean stature of coastal peoples to be between 155 and 165 centimeters, while other travelers give a general average of 155.5 centimeters.

Compared even with this lowest figure for Papuans, the measurements secured at certain localities are so low that, supported by additional anatomical evidence, they have been taken as indications of a once distinct Pygmy race now more or less merged into the Papuan population. Thus, Pösch found a mean stature of only 152.5 centimeters in the Kai area, with 12 adult males ranging from 133 to 145.6 centimeters (4 feet, 4½ inches to 4 feet, 9¼ inches). In the same area Keysser obtained an average of 153.9 centimeters for adult males, with 73 of 273 individuals below 150 centimeters, while over 300 women averaged only 144.4 centimeters. Neuhauss pointed out various other Pygmoid traits in this population, such as the unusually small lobes of the ear, convex upper lip, and relative shortheadedness (index, 79-80). However, convincing evidence of a definite tribe of Pygmies, as opposed to mere Pygmy strains in Papuan peoples, was discovered by the Wollaston expedition only in Dutch New Guinea. The tribe in question, named Tapiro, is characterized by short, woolly, and black hair; relatively light color of the skin; a mean stature of 1.449 meters (4 feet, 9 inches), the shortest individual being only 1.326; a cephalic index of 79.5; and convexity of the upper lip. On the basis of these discoveries Haddon recognizes a Pygmy race in New Guinea, related to woolly-haired and broad-headed Negrito of the Andaman Islands, the Malay Peninsula, and the Philippines.

Two entirely distinct groups of languages exist in Papua, the Melanesian and the Papuan. The Melanesian languages of the island are closely related to one another and to those spoken in Melanesia, e.g., in the Solomon Islands and New Hebrides, the Melanesian languages of both areas representing an older and fuller form of speech, of which the Polynesian is a later and simplified offshoot. While the Melanesian languages thus form a uniform stock, those designated as Papuan differ so widely as to be not merely mutually unintelligible but even to present radically distinct morphological traits. The term is therefore based mainly on negative features and is equivalent to non-Melanesian-Polynesian. There is some similarity with Australian languages, but not sufficient to prove affinity.

Culturally the natives of Papua differ almost as much as in point of speech. Until the coming of the whites all lived in the Stone age, but were able to execute extraordinary carvings with the aid of their crude implements. They are primarily agriculturists and vegetarians, subsisting on taro, yams, bananas, coconuts, sago, and the breadfruit. Pigs and dogs have been domesticated. Hunting is relatively unimportant, but fishing is extensively practiced. The form of habitation varies, but pile dwellings are exceedingly common. In many localities there are large structures serving at the same time as a sleeping place for the young men, as a council house, and as a ceremonial hall. Pottery occurs sporadically. The spear, bow and arrow, and club form the principal weapons; in some districts spears are hurled with the spear thrower. Shields are widely diffused. No general statement is possible as to social organization and religious beliefs; in some tribes, e.g., between Dallmannhafen and Berlinhafen, totemism with exogamy has been recorded. The nonmaterial aspects of Papuan culture are only beginning to become known.

Government. The natives have developed no system of government worthy of the name. A certain loose patriarchy exists, but its authority is generally limited to the family. The British administration exercises control over the natives largely through native village policemen, who number about 550.

In 1883 Queensland proclaimed the territory's annexation, which, however, was disallowed by the British government. But in the following year the establishment of a British protectorate was announced; this was subsidized by Queensland, New South Wales, and Victoria until September, 1888, when it became a British possession, receiving the constitution of a crown colony, in association, however, with Queensland. Port Moresby was made the official headquarters; a supreme court was established there, and magisterial courts in other places. Pursuant to letters patent of 1902, accepted by a Commonwealth Act of 1905, the territory passed to the administration of the Commonwealth government Sept. 1, 1906. Its name at this time was changed from British New Guinea to Territory of Papua. The territory did not become a part of the Commonwealth. Administration is in the hands of a lieutenant governor, who is assisted by an Executive Council of six official members. There is a Legislative Council consisting of the Executive Council and of three unofficial members. The territory is divided into 11 magisterial districts; in each is a resident magistrate,

invested not only with judicial but with certain executive and administrative powers.

Local revenue increased from £19,274 in 1904-05 to £34,822 in 1909-10 and £54,703 in 1913-14. The expenditure in 1913-14 was £81,095, the deficit being covered by Commonwealth grant.

Production, Commerce, etc. Rich soils at varying elevations and, in most districts, abundant rainfall make possible the successful cultivation of nearly every tropical product. In 1913 there were 216 plantations, of which the aggregate area under cultivation was 35,363 acres; of this acreage, 21,958 acres were planted to coconuts, 6256 to rubber, and 3057 to hemp. Other cultures are cotton, coffee, vanilla, cacao, tea, and tobacco. To insure adequate food supply for the natives, the latter are compelled to plant coconuts; the area so planted amounts to about 350,000 acres. Valuable indigenous products include sandalwood and other timber, rubber, sugar cane, bananas, various spices, breadfruit, sago, nuts, fruits, etc. Little progress has been made in stock breeding. The introduction of rabbits, hares, foxes, and monkeys is prohibited.

Many metallic minerals are widely distributed, and there are both coal and petroleum. Gold was discovered in 1888, and up to June 30, 1913, the amount won was valued at £1,291,670; the yield in 1909-10 was £60,181, in 1912-13, £64,115. About 150 whites and 800 indentured laborers are engaged in gold mining, which is chiefly alluvial. After gold, copper forms the most valuable mineral yield. The pearl-shell fishery is an important industry, and bêche-de-mer is found on most of the reefs. There are no European manufactures. Native manufactures include pottery, mats, fishing nets, canoes, shell ornaments, decorated gourds, and stone implements.

Imports and exports were valued in 1904-05 at £67,188 and £76,435 respectively; in 1909-10, £120,177 and £100,599; in 1913-14, £212,134 and £123,140. The principal imports are foodstuffs, textile goods, and clothing, iron wares and machinery, building materials, and tobacco. Up to the year 1911-12 more than half the export value represented gold. In that year the gold export was £49,316 and, in 1913-14, £41,222. Copper ore was exported in 1912-13 to the value of £18,997; copra, £16,912; pearls, £9284; pearl and turtle shell, £8842; hemp, £3039; bêche-de-mer, £1871; rubber, £517. Trade is chiefly with Queensland and New South Wales. Ports of entry are Port Moresby (pop., about 1600 natives and 425 whites), just east of 147° E.; Samarai, an island of some 60 acres, with good anchorage, off the southeast end of the mainland; Daru, also a small island, with good harbor, near the mainland a little east of 143° E.; and Bonagai, in Woodlark Island. There are substantial wharves at Samarai and Port Moresby, which has a large and sheltered harbor. Internal communications are largely by river. Four missionary societies are represented in the territory. The population was estimated in 1914 at 250,000 Papuans and 1186 Europeans.

Bibliography. General description: Sir C. R. Markham, "Progress of Discovery on the Coasts of New Guinea," in Royal Geographical Society, *Papers* (London, 1884), contains a list of early discoverers; H. H. Romilly, *The Western Pacific and New Guinea* (2d ed., ib., 1887); H. Cayley-Webster, *Through New Guinea and the Cannibal Countries* (ib., 1898); Sir W. Mac-

Gregor, *British New Guinea* (ib., 1899); A. E. Pratt, *Two Years among New Guinea Cannibals* (Philadelphia, 1906); Kenneth MacKay, *Across Papua* (New York, 1909); Fritz Hochberg, *An Eastern Voyage* (2 vols., London, 1910); Frank Burnett, *Through Polynesia and Papua* (ib., 1911); J. H. P. Murray, *Papua or British Guinea* (New York, 1912); C. G. Rawling, *The Land of the New Guinea Pygmies* (London, 1913); Henry Newton, *In Far New Guinea* (ib., 1914). Antiquities: G. W. Earl, *Papuans: Native Races of the Indian Archipelago* (London, 1853); Otto Finsch, *Neuguinea und seine Bewohner* (Berlin, 1869); R. H. Codrington, *Melanesian Languages* (Oxford, 1885); Otto Finsch, *Reisen in Kaiser Wilhelms Land* (Leipzig, 1888); R. H. Codrington, *The Melanesians* (Oxford, 1891); Otto Finsch, *Ethnologische Verfahrungen* (Vienna, 1893); A. C. Haddon, *Decorative Art of British New Guinea* (London, 1894); Meyer and Parkinson, *Album von Papua-Typen* (Leipzig, 1894-1901); Hagen, *Anthropologische Atlas* (Wiesbaden, 1898); id., *Unter den Papuas* (ib., 1899); A. C. Haddon, *Head Hunters: Black, White, and Brown* (London, 1902). Ethnology: Stefan von Kotze, *Aus Papuas Kulturorgen* (Berlin, 1905); Van der Sande, *Nova Guinea* (Eng. trans., Leyden, 1907); Roy, *Reports of the Cambridge Anthropological Expedition to Torres Strait*, vol. iii (Cambridge, 1907); C. G. Seligmann, *Melanesians of British New Guinea* (New York, 1910); R. Neuhaus, *Deutsch Neu Guinea* (3 vols., Berlin, 1911); R. W. Williamson, *The Mafalu* (London, 1912); A. F. R. Wollaston, *Pygmies and Papuans* (New York, 1912). Natural history: C. Lyne, *New Guinea* (London, 1885); J. Gould, *Birds of New Guinea and Papuan Islands* (2d ed., ib., 1887-88); Schumann and Lautermach, *Flora der deutschen Schutzgebiete in der Südsee* (Leipzig, 1901); *The Australasian Handbook* (London, 1906); A. S. Meek, *A Naturalist in Cannibal Land* (ib., 1913).

PAPUAN BIRD OF PARADISE. See Colored Plate of BIRDS OF PARADISE.

PAPUANS. See PAPUA.

PAPUAN or AUSTRO-MALAYAN SUBREGION. In zoogeography, a northern subdivision of the Australian Region, formed of the islands eastward of Wallace's Line to San Cristoval, embracing Celebes, Lombok, the Gilolo group, Ceram, New Guinea, and the Solomons. All are mountainous, well forested, hot, and damp, excepting the small arid group from Lombok to Timor. Considering the proximity and physical resemblance of these islands to those west of them, and their dissimilarity to the continent of Australia, it is surprising to find that their affinities are Australian rather than Oriental. The mammals are almost wholly marsupials, with one monotreme (see ECHIDNA) in New Guinea. A long list of peculiar genera of birds may be made, and this subregion is the special home of the birds of paradise, honey suckers, some peculiar flycatchers, and a host of most brilliant parrots, kingfishers, and pigeons. The extraordinary tendency towards ornamentation which characterizes the birds of these islands extends also to the insects and has been the object of much speculation. Consult: A. R. Wallace, *Geographical Distribution of Animals*, vol. i (New York, 1876); H. O. Forbes, *A Naturalist's Wanderings in the Eastern Archipelago* (ib., 1885); A. R. Wallace, *Malay Archipelago* (new ed., London, 1906).

PAPUAN WREATHED HORNBILL. See Plate of HORNBILLS AND TOUCANS.

PAPULE (Lat. *papula*, pimple, pustule). A medical term applied to a small elevation of the surface of the skin containing no fluid. Papules are either of the normal skin color or red. If they become filled with fluid, they are called vesicles. If pus develops in a vesicle, it is called a pustule. Papules appear in the early stage of many skin diseases and form the eruption in certain other diseases, as scarlet fever, chickenpox, and smallpox. Papular skin diseases include lichen, prurigo, and pityriasis (qq.v.).

PAPWORTH, pāp'wūth, WYATT ANGELICUS VAN SANDAU (1822-94). An English architect and antiquary, born in London and trained in the offices of his father and of Sir John Rennie. He made a special study of the authorship of English mediæval buildings, won a silver medal in 1849 for an essay on Palladian architecture, and thereafter contributed frequently to the *Transactions* of the Royal Institute of British Architects (of which he became fellow in 1860). Wyatt Papworth is best known for the *Dictionary of Architecture* (8 vols., 1853-92), which he edited for the Architectural Publication Society. In 1893 he became curator of Sir John Soane's Museum in Lincoln's Inn Fields, London.

PAPYROGRAPH. See COPYING MACHINES AND PROCESSES.

PAPYRUS (Lat., from Gk. *πάπυρος*, papyrus). A genus of plants of the natural order Cyperaceæ. Egyptian papyrus (*Cyperus papyrus*) is a kind of sedge, 3 to 10 feet high, with a very strong, woody, aromatic, creeping root, long, sharp-keeled leaves, and naked, leafless, triangular, soft, and cellular stems, as thick as a man's arm at the lower part, and at their upper extremity bearing a compound umbel of extremely numerous drooping spikelets with a general involucre of eight long filiform leaves. It is now extinct in Lower Egypt, but is still



EGYPTIAN PAPYRUS.

found in the upper Nile. The plant is represented in the oldest Egyptian monuments as reaching the height of about 10 feet. The papyrus was used for many purposes. The more slender stalks were woven into baskets and boxes, while bundles of the thicker stalks formed the material of which light boats were constructed. The fibre was used for making cordage, sails, awnings, and matting. The pith was boiled and eaten by the poorer classes, and the root was dried and used as fuel. The most important use of the plant, however, was

to which the natural gum of the plant gave a homogeneous character, and the sheet when dried was ready for use. It is possible that artificial paste was sometimes used to bind the fibres. When newly prepared the sheet was white or brownish white; but in the process of time those papyri which have reached the present day have become of a light or dark brown color and exceedingly brittle. The papyrus or paper of the Egyptians had a great reputation in antiquity, and it appears on the earliest monuments in the shape of long rectangular sheets, which were rolled up and tied with a string. At a very late period the papyrus was no longer rolled, but was cut into square pages which were bound together as are the leaves of a modern book. The papyrus sheets and rolls vary in size, from 9 to 15½ inches in height and from 5 to 9 in width, the larger dimensions being very rare. The strips seem to have been sold in lengths of about 20 sheets, but there is no limit to the length of the rolls, though for literary purposes the Greeks seem rarely to have exceeded 30 feet. The ancient Egyptians made up huge rolls—one is said to be 144 feet long—for burial with the dead, though there is little likelihood that such unwieldy volumes were used by the living. The writing is regularly in columns, parallel to the length of the roll, and of varying width, in literary prose rarely exceeding 3 inches, though in verse they are often wider to accommodate the longer lines of the hexameter. Public documents and private papers are of course bound by no such rules. The use of papyrus paper, or at least of some similar manufacture from vegetable fibre, must have arisen at an early date in Egypt, and the oldest datable specimen can be but little later than 3600 B.C. (For a description of the Egyptian papyri and their contents, see *Literature and Science* under EGYPT.) The Greeks seem to have known a paper as early as the beginning of the fifth century B.C., though the oldest extant Greek papyrus is perhaps the *Persians* of Timotheus, belonging to the end of the fourth century. With the growth of the Alexandrian Library and the spread of Greek learning the use of papyrus largely increased, and the manufacture of the paper seems to have developed greatly under the patronage of the Ptolemies. It is only in comparatively recent years that the attention of scholars and explorers has been drawn towards the Greek papyri of Egypt and that systematic search has been made for them. The great bulk of the enormous mass of papyri brought to light consists of nonliterary documents, partly public, such as official correspondence, laws, petitions, and tax receipts, and partly private, including wills, contracts, letters, and notes, school exercises, and accounts. These documents are of immense value as enabling us to reconstruct the life and language of the common people in the towns and villages of Egypt under Greek and Roman rule. Though the literary papyri are relatively few, they are often of great importance as restoring to us works formerly lost. Among the more important are the *Orations* of Hyperides, the *Mimes* of Herondas, the *Odes* of Bacchylides, the treatises of Aristotle on the Constitution of Athens, and the *Persians* of Timotheus. Of Christian writings the yield has not been large nor of very striking value. There are a few fragments from the New Testament and the Septuagint, some scraps of apocryphal or heretical writings, and especially the interesting leaf from Oxyrhynchus

containing some Logia or sayings attributed to Jesus. The first great discovery of papyri in Egypt was made near Arsinoë in the Fayum in 1877. Fifteen years later at Socnopoei Nesos, also in the Fayum, another rubbish heap was opened, most of whose contents went to Berlin. While the first mass was chiefly Byzantine, these were Roman and on the whole in fair preservation. An earlier period, extending well into the third century B.C., was revealed by the discovery by Flinders Petrie of a series of mummy cases made of old papyri pasted together. Patient labor separated these fragments and brought to light remnants of the lost *Antiope* of Euripides, as well as bits of the *Gorgias* and *Phaedo* of Plato, and many nonliterary fragments. All previous discoveries were surpassed by the work of Grenfell and Hunt at Oxyrhynchus in 1896-97, and to their continued labors at other points in the Fayum and especially at Tebtunis a large part of the increase since then is due. Outside of Egypt discoveries of papyri have been almost unknown. In 1753 a great mass of charred rolls were found in the Villa Suburbana at Herculaneum, and a few of these have been unrolled by means of a very delicate apparatus, but their contents have been a disappointment, as they have proved to be philosophical treatises of the Epicurean school, though the fragments of Philodemus have added somewhat to our knowledge of the history of ancient philosophy. For the handwriting on papyri, see EGYPTOLOGY; PALEOGRAPHY.

As a matter of scientific interest experiments in the manufacture of paper from the papyrus have been made in modern times by Landolina, Seyffarth, and others, and a small quantity is made at Syracuse in Sicily.

The papyrus plays an important part in Egyptian decoration and architecture. The peculiar swelling of the shafts of columns at the base and their upward taper, the wrapping leaves painted on their lower parts, and the form and ornamentation of the campaniform capitals are clearly derived from the papyrus. Whether the "bud" capitals represent lotus buds or closed papyrus umbels is a debated question. Papyrus thickets are frequently represented in mural pictures, and the common Egyptian torus seems to represent bundles of papyrus stalks.

Other species of papyrus (*Cyperus Corymbosus*, *Cyperus tectum*) are much used in India for mats. *Cyperus alternifolius*, the umbrella plant or umbrella palm, is a common house plant. It grows to a height of 1 to 3 feet, with drooping involucre rays 6 to 8 inches long and less than ½ inch broad.

Bibliography. Ulrich Wilcken, *Die griechischen Papyrusurkunden* (Berlin, 1897); F. G. Kenyon, *Palaography of Greek Papyri* (Oxford, 1899); Karl Dziatzko, *Untersuchungen über ausgewählte Kapitel des antiken Buchwesens* (Leipzig, 1900); G. A. Reisner, *Hearst Medical Papyrus* (Berkeley, 1906); Shubart, *Das Buch bei den Griechen und Römern* (Berlin, 1907); on the results for biblical study, Deissmann, *Bible Studies*, translated by Grieve (Edinburgh, 1901). A periodical devoted to this subject is the *Archiv für Papyrusforschung und verwandte Gebiete* (Leipzig, 1900 et seq.); and a brief review of the more important publications of each year may be found in the *Annual Archaeological Reports of the Egyptian Exploration Fund* (London, 1883 et seq.).

PAPYRUS, THE ORBINEY. See EGYPT, *Literature and Science*.

PAPYRUS, THE TURIN. See TURIN PAPYRUS.

PAPYRUS LETTERS. The need for some reliable means of communication between persons situated at a distance from one another is so universal that one naturally would be led to believe that the writing of letters was as well known to the ancient Greeks as to other peoples of antiquity and to ourselves at the present time. The Tell el Amarna letters, written by certain Babylonian kings and governors of Phoenicia and Palestine to the Pharaohs of Egypt about 1400 B.C., show how early we have evidence for the writing of letters in ancient times.

For Greece, however, the earliest reference to epistles is found in the *Iliad* (vi, 169), where the story is told that Proteus, wishing to get rid of Bellerophon (with whom the former's wife had fallen in love), sent him to Iobates, the King of Lycia, with sealed instructions that he should be put to death. This, of course, is but a reference to the practice of letter writing. Considerably later comes another allusion to letter writing in Herodotus (v, 25). Here a curious tale is told of Histæus, who, wishing to urge Anaxagoras to revolt and not daring to communicate with him by the ordinary form of letter, shaved the head of a faithful slave, tattooed the letter upon the scalp, and, after allowing the hair to grow again, dispatched the slave to Anaxagoras. From about the same time come the most notorious examples of letter writing, perhaps, in the supposititious letters of Phalaris, tyrant of Agrigentum. Until the time of Bentley (*Epistles of Phalaris*, London, 1883) these had been accepted as genuine. This scholar showed them to be forgeries; but since they are believed to be by Atossa, Queen of Persia, the antiquity of the collection is still admitted.

Then one comes to the letters of Isocrates, who is said on one occasion to have been taken by the General Timotheus to look after his correspondence (*Plutarch*, x, orat. 4, 9). The preserved letters of Isocrates, while observing epistolary form, are in fact philosophic and oratorical productions destined undoubtedly for publication. The same is true of the letters of Dionysius of Halicarnassus.

Quite different, on the other hand, is the letter sent by Philip of Macedon to the Athenians with a view to setting before them his reasons for declaring war against them. This letter, which begins with the ordinary salutation "Philip to the Senate and People of Athens," is a true illustration of ancient correspondence (Demosthenes, *Orations*, xii). The letter interpolated in the *Oration on the Crown* (id., *De Corona*, 77-78), while a forgery, is nevertheless a satisfactory example, so far as touches form, of ancient epistolography. This, which begins with "Philip, King of Macedon, to the Senate and People of Athens," conforms a little more to polite usage by ending with the usual and conventional "farewell."

Somewhat later than the letters of Philip comes an amiable little note written by the distinguished philosopher Epicurus to a little girl, in which the affectionate diminutives "papa" and "mamma" appear.

But by far the most illuminating light thrown on ancient letter writing comes from the discoveries made in the Fayum district of the Nile valley. Within a few years the Egyptian

Exploration Fund, acting through Grenfell and Hunt, and others, have recovered numerous papyri, buried with the dead, which exhibit letters written in the time extending roughly from the second century B.C. to the fourth century of our era. Some of the letters date even later. These documents are of inestimable value to the student of Greek epistolography, for they were written with no thought of ultimate publication or of posterity and deal with matters of the most diverse character. A perusal of their contents results in a startling realization of the similarity of interests of people of all times. It is, in fact, most easy to imagine one's self in the surroundings unconsciously depicted in these letters. Thus, one finds a formal invitation to a wedding couched in the words "Eras invites you to a wedding to-morrow, the twenty-ninth, at the ninth hour"; or an equally formal invitation, "Heratheon invites you to dine with him, on the occasion of his examination, at his house to-morrow the fifth at the ninth hour"; or again the invitation of a cavalry officer running, "The decurion invites you to his party on the sixth day before the calends at eight o'clock."

Many of the letters, as one might expect, deal with ordinary domestic affairs. A slave, Aphrodite, writes her mistress about her work, Aphion tells Didymus of his sister's illness, or Nicanor writes about some clothing which has been lost. Once in a while the letters are most unusual in character. A woman, Helene by name, sends a most ungrammatical epistle to her brother reproaching him for not attending the funeral of another brother, ending in a casual fashion with a request that he execute certain commissions and that he send their father a fish. Some one else writes about the purchase of yokes and manure, while Troilus, rich but illiterate, tells his sister to "have my tunic properly made and let them put good measure on it and be generous in coloring." Equally characteristic is a letter in which Herochides is asked to match a white-violet color and to purchase two drachmas' worth. The request is accompanied by a gift of six quarts of "good apples."

Nothing could be more modern than the anxious letter of a mother writing to her boy deploring the leaving of his tutor and urging him to be studious and to get another good one; and refreshing in its up-to-dateness is the indignation of a man who writes to his son that "Aunes, the donkey driver, has bought a rotten bundle of hay at 12 drachmas, a little bundle and rotten hay, the whole of it decayed and no better than dung." And yet all letters are not trivial and amusing. Grief touched these people, and consoling friends sent letters which in distinctly modern spirit ended with "There is nothing to do in the face of such trouble."

So it is that the whole gamut of human interests is run. Some one urges another for a position or sends a begging letter, a pompous individual writes grandiloquently to his wife, while another man writes about a mouse catcher who is engaged to free his house from the pest. Sometimes one finds an official sending instructions to the effect that some woman is to be arrested for dealing in contraband oil, another authorizing the embarkation of corn on a government transport, or giving instructions that a body of striking quarry slaves be apprehended as soon as possible.

Humor is present in those letters. Sometimes it is consciously afforded, as in a letter from Sarapion to his brother Dorion, in which, after certain serious matters are discussed, Dorion is asked to let his brother "hear about our bald-headed friend, how his hair is growing again." Sometimes the humor is unconsciously afforded, as in a letter from Sereness to his wife who has deserted him. His desolation at once appears with the words "I assure you that ever since you left me I have been in mourning, weeping by night and lamenting by day. Since we bathed together on Phaophi first I never bathed nor anointed myself until Athur twelfth."

In more serious mood one finds Lucius writing to his brother Apollinarius warning him to look out for "white-slavers" who have designs upon the daughter of a deceased friend of theirs. Even as now, debts were hard to collect in those old days, so that Sarapammon was forced to write to Piperas, "Let me tell you that you owe me seven years' rents and dues; so, unless you now send discharges, you know the danger." But if such a letter as this shows that human nature is a constant at all times, it can be shown even better by a letter written by a disappointed little boy to his father. It runs: "It was a fine thing of you not to take me with you to the city. If you won't take me to Alexandria I won't write you a letter, or speak to you, or say good-by to you; and if you go to Alexandria I won't take your hand or ever greet you again. That is what will happen if you don't take me. Mother said to Archelaus, 'It quite upsets him to be left behind.' It was good of you to send me presents on the twelfth, the day you sailed. Send me a lyre, please! If you don't I won't eat, I won't drink; so there!"

In these letters the formal manner of salutation was "Ptolemaus to Heraclides, greeting," and the letter was terminated by the word "good-by," followed by the date. But, as can easily be imagined, the salutation varied according to the intimacy and affection of the persons concerned. In place of simple "greeting" often occurs "many greetings," while a fond father might open a letter to his son with "Cornelius to his sweetest son, Hierax, greeting." Sometimes the salutation becomes most ambitious, as in the following: "Ptolemaus to Heraclides, greeting. If you are well, and if the objects of your care and other concerns are to your mind, I should be glad, and much gratitude would be due to the gods. I myself also am in good health." Such a salutation, it must be said, is unusual.

The outside of the letter carries the address, as a rule in the form "To Tyrannus" or "To Faustus . . . at Nekle." This was sometimes expanded to read "Deliver to my brother Dorion" or "Deliver from Dionysius to his sister Didyme."

Bibliography. *Isocrates, Orationes et epistolæ*, edited by J. G. Baier (Paris, 1846); "Ein Brief Epicurs an ein Kind," in *Hermes: Zeitschrift für klassische Philologie* (Berlin, 1871); Hercher, *Epistolographi græci* (Paris, 1877); "Epicurus," in *Hellenica*, edited by Evelyn Abbott (London, 1880); W. R. Roberts, *Dionysius of Halicarnasus, the Three Literary Letters* (Cambridge, 1901); Bentley and Peter, *Der Brief in der römischen Litteratur* (Leipzig, 1901); *Epistulae privatae Græcæ quæ in papyris ætatis Lagidarum servantur*, edited by Stanislaus Wit-

lowaki (ib., 1906); Iwan Müller, in *Handbuch der klassischen Altertumswissenschaft*, vol. vii (Munich, 1911-13); and especially *The Oxyrhynchus Papyri*, vols. i-x, edited by Grenfell and Hunt (London, 1898-1914); Grenfell, Hunt, and Hogarth, *Fayum Towns and their Papyri* (ib., 1900); Grenfell, Hunt, and Smyly, *The Tebtunis Papyri* (ib., 1902); Grenfell and Hunt, *The Hibeh Papyri* (ib., 1906).

PARÁ, pá-rá'. An estuary indenting the northeast coast of Brazil and forming the south boundary of Marajo Island (q.v.), of which the true mouth of the Amazon is the north boundary (Map: Brazil, H 4). The Rio Pará is 40 miles wide at its mouth and has, in general, a width of 5 to 10 miles for a distance of 200 miles inland. Formerly it was probably one of the principal mouths of the Amazon, but is now connected with that river only by a network of channels and backwaters, which however form the principal steamship routes to the Amazon, since the true mouth is obstructed by islands and strong currents. The Pará has become the almost independent estuary of the Tocantins (q.v.).

PARÁ. One of the largest and commercially most important states of Brazil, occupying the northeastern part of the Republic, and bounded by the Guianas on the north, the Atlantic Ocean on the northeast, the Brazilian states of Maranhão and Goyaz on the east, Matto Grosso on the south, and Amazonas on the west (Map: Brazil, H 4). Its area is 482,600 square miles. The surface consists of plateaus rising from the here narrow Amazonian valley to a height of 2500 feet in the north and south. The Amazon River with its extensive estuary takes in a large portion of the state, and the adjoining lowlands are inundated during the rainy season. Its two large tributaries, the Tapajos and the Xingú, and the system of the Tocantins, give the state a network of navigable waterways and thus remove one of the greatest obstacles in the way of industrial development in South American countries—lack of transportation facilities. The climate is hot and moist, but being tempered by the trade winds is not unhealthful. Most of the lowlands are covered with dense forests, which yield the most important product as well as the chief source of revenue of Pará—rubber. Cabinet woods and medicinal plants also abound. Agriculture is little developed on account of the scarcity of population, but some cotton, tobacco, and cereals are raised. The principal exports are rubber (10,311,323 kilos in 1911), cacao, Brazil nuts, and hides. Most of the exports go to New York and Liverpool. The mineral deposits of Pará, including petroleum, iron, copper, and lead, are believed to be extensive, but so far very little has been done towards their exploitation. Pará has two short railways—one from the capital to the coast and one around the rapids of the Tocantins. The population of Pará was 445,356 in 1900 and 660,000 (est.) in 1913. The Indians are mostly civilized. The capital is Pará (q.v.).

PARÁ, or BELÉM. The capital of the State of Pará, Brazil, situated on the southeast shore of the Pará estuary (q.v.), 85 miles from the ocean and 1° 27' south of the equator (Map: Brazil, H 4). Viewed from the harbor, it presents a picturesque appearance with its numerous churches and white houses half hidden amid luxuriant tropical foliage. The streets are in general narrow and ill-paved, but some of

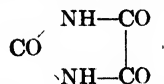
them are wide and straight, and there are several spacious avenues lined with trees. The principal building is the cathedral, dating from 1720. There are a lyceum and other schools, a public library, a museum, a large botanical garden, and many scientific, literary, and charitable institutions. The government buildings are plain structures. The harbor has 30 feet of water, and being situated at the principal entrance for ships into the Amazon and in the northern part of the country, where it is comparatively near to the commercial countries of Europe, Pará has become an important trade centre. Its chief exports are rubber, cacao, and Brazil nuts. It is one of the leading ports of the world in rubber export and controls about one-half that of Brazil. In 1912 it amounted to 20,366,414 kilos, valued at about \$35,583,000. The total exports for 1912 were 116,112,152 milreis (32.4 cents) and the imports 47,377,541 milreis. The population has increased rapidly during the last 50 years and was estimated at 170,000 in 1913. Pará is the seat of a United States consul.

Pará was founded in 1616, but was unimportant until the middle of the nineteenth century. During the disastrous racial and social strifes of 1835-48 the population fell from 25,000 to 15,000, and it was still further reduced by the epidemic of yellow fever in 1850. Since that year, however, it has grown rapidly.

PARA (Pers. *pāra*, piece, portion). A coin of copper, silver, or mixed metal, though generally of copper, in use in Turkey, Egypt, Cyprus, Montenegro, and Serbia; it is the fortieth part of a piastre (\$0.044 in Turkey and \$0.04943 in Egypt in 1914), is divided into three aspers, and varies much in value, owing to the debased and complicated condition of the Turkish coinage. Pieces of five paras are also in use. The para is equal to about one mill (American) in Turkey and a little more in Egypt. In Montenegro it is $\frac{1}{100}$ of a perper, or equivalent to \$0.002026 United States money, and in Serbia it is $\frac{1}{1000}$ of a denar, or \$0.00193.

PARA-ACETPHENETIDINE. See PHENACETIN.

PARABANIC (pär'a-bän'ík) **ACID**, or OXALYL UREA, $C_2H_2N_2O_3$. A chemical compound of carbon, hydrogen, nitrogen, and oxygen, prepared by the action of various oxidizing agents upon uric acid or upon guanine. It was first obtained by Liebig and Wöhler in 1838. It acts as a dibasic acid, the two hydrogen atoms of its molecule being replaceable by metals; thus, its acid and neutral silver salts have respectively the formulæ $C_2HN_2O_3Ag$ and $C_2N_2O_3Ag_2$. Parabanic acid is moderately soluble in water. It melts at 100° C. (212° F.). Its chemical constitution is represented by the formula



PAR'ABLE (OF. *parable*, *parabole*, Fr. *parabole*, from Lat. *parabola*, *parabole*, from Gk. *παράβολη*, a juxtaposition of things, a comparison, a similitude, from *παράβαλλειν*, *paraballein*, to throw beside, to compare, from *παρά*, *para*, beside + *βάλλειν*, *ballein*, to throw). A term originally used by Greek rhetoricians for any distinctly introduced literary illustration. The later Greek writers used it more specifically for a short fictitious narrative, founded upon any real event in nature or human experience, in-

tended to convey a moral or religious meaning. It thus differs from the apologue (q.v.) in being inherently probable in itself, and from the allegory (q.v.) in being less artificial. The parable is best known from its use in the Bible, the revisers, however, using the word much more comprehensively than the technical sense would justify. In the Old Testament it is not, in its strictly defined meaning, of common occurrence. The five examples which admit of the least question are: (1) the prophet Nathan's parable of the poor man with the one ewe lamb, told to King David (2 Sam. xii. 1-4); (2) the story of the woman of Tekoa concerning her sons (2 Sam. xiv. 5-7); (3) the tale of the prophet regarding the escaped captive, told to King Ahab (1 Kings xx. 39-40); (4) Jehovah's rebuking song of the vineyard (Isa. v. 1-6); and (5) the parable of planting and threshing (Isa. xxviii. 24-28). Ancient Jewish writings outside the Bible, however, abound in parables. In the New Testament the word *παράβολή* occurs 48 times in the Synoptic Gospels, but nowhere else except twice in the Epistle to the Hebrews (ix. 9; xi. 19, rendered "parable" in the English revision, but "figure" in the Authorized Version and in the American revision). It designates either a short narrative designed to convey spiritual truth, such as the parable of the sower (Matt. xiii. 8 et seq.), or, more rarely, a popular proverb, such as "Physician, heal thyself" (Luke iv. 23). Hence many of the utterances of Jesus, which are commonly regarded as proverbs ("consider the lilies," "salt of the earth," "light under a bushel"), might be classified as parables.

Bibliography. Thomas Guthrie, *The Parables* (London, 1866); R. C. T. Trench, *Notes on the Parables of Our Lord* (New York, 1882); Siegfried Goebel, *The Parables of Jesus* (Eng. trans., Edinburgh, 1883); Winterbotham, *The Kingdom of Heaven* (New York, 1898); A. Jülicher, *Die Gleichnisse Jesu* (Freiburg, 1899); C. A. Bugge, *Die Haupt-Parabeln Jesu* (Giessen, 1903); Paul Fiebig, *Alt-jüdische Gleichnisse und die Gleichnisse Jesu* (Tübingen, 1904); Weinle, *Die Bildersprache Jesu in ihrer Bedeutung für die Erforschung seines inneren Lebens* (Giessen, 1906); A. L. Lilley, *Adventus Regni* (London, 1907); A. B. Bruce, *The Parabolic Teaching of Christ* (4th ed., New York, 1911); Marcus Dods, *Parables of Our Lord* (new ed., 2 vols., ib., 1912); R. M. Lithgow, *Parabolic Gospel* (ib., 1914); George Murray, *Jesus and His Parables* (ib., 1914).

PARABOLA (Neo-Lat., from Gk. *παράβολή*, *parabolē*, comparison, juxtaposition, parable, parabola). A conic section cut by a plane parallel to the element of the cone. When the plane coincides with its parallel element, the parabola assumes the limiting form of a straight line. The parabola may also be defined as the locus of a point whose distance from a fixed point (the focus) is equal to its distance from a fixed straight line (the directrix), i.e., its eccentricity (q.v.) is 1. From this definition its construction readily follows. Let DD' (Fig. 1) be the fixed straight line or directrix, and F the fixed point or focus. Draw a perpendicular to the directrix, passing through the focus, and this will be the axis of the curve. The point O on the axis, halfway between F and DD' , will evidently, from the second of the above definitions, be a point on the curve. To find other points on the curve draw a series of lines par-

allel to the directrix and cutting the axis XA' in M_1, M_2, F, M_3, \dots . With F as a centre and ZM_1 as a radius, describe an arc cutting the perpendicular through M_1 in P_1 and Q_1 ; with F as a centre and ZM_2 as a radius, describe a circle cutting

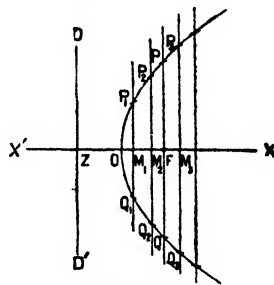


FIG. 1.

the perpendicular through M_2 in P_2 and Q_2 ; and so on. The points $P_1, P_2, \dots, Q_1, Q_2, \dots$ are then points on a parabola. PQ is called the latus rectum or parameter, and, as is evident from the construction, equals twice the distance between the focus and directrix. The curve may be described mechanically in the following manner: Move a right-angled triangle with one perpendicular side coinciding with the directrix; a string equal in length to the other perpendicular side has one end fastened to the outer vertex of the triangle and the other to the focus; a pencil resting against the lower side of the triangle and holding the string taut will trace a parabola.

The Cartesian equation of the parabola, its axis being taken as the X -axis and its vertex as the origin, is $y^2 = 2px$, where $\frac{1}{2}p$ is the distance between the focus and the vertex. Its polar equation, the focus being the pole, is

$$r = \frac{p}{1 - \cos \theta}; \text{ or } r = \frac{2p \cos \theta}{\sin^2 \theta}$$

when the vertex is taken as the pole. The following are some of the most important properties of the parabola: (1) Any line RH (Fig. 2) parallel to the X -axis is a diameter, i.e., it bisects a system of parallel chords, as

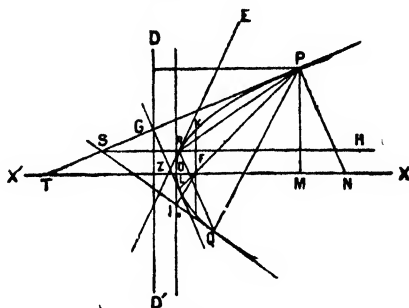


FIG. 2.

those parallel to PQ ; (2) the subnormal MN is constant and equal to the semilatus rectum FK ; (3) if the tangent through P cuts the X -axis in T , and if the normal at P cuts the X -axis in N , the focus F is equidistant from P , T , and N ; (4) the angle $DPT = \text{angle } XTP$ is equal to the angle TPF , or the tangent at any point makes equal angles with the axis of the curve and the

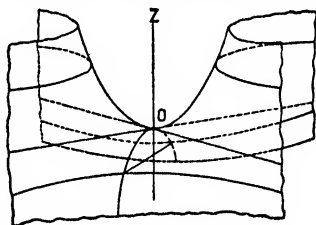
focal radius to the point of contact (these last two properties furnishing simple methods for drawing tangents to the parabola); (5) through any point in the plane three normals can be drawn to the parabola; (6) the tangents at the extremities of any focal chord PL intersect at a point G on the directrix and at right angles; (7) a perpendicular from the focus F upon a tangent SQ meets this tangent at a point I on the tangent through the vertex; (8) a tangent RE at the end of a diameter RH is parallel to the chords bisected by that diameter, of which PQ is one, and the tangents at the extremities of PQ intersect upon the corresponding diameter SH ; (9) the area of a parabolic segment $ORPQ$ is $\frac{1}{6}$ of the triangle RPQ on the same base and having the same height; (10) the parabola has no real finite asymptotes.

Concave reflecting mirrors are often formed so that all axial sections are equal parabolas. In such a mirror all parallel rays of light are reflected to the focus; and, conversely, if a light is placed at the focus of such a mirror, its rays are reflected in a parallel pencil. If a body were projected upward and obliquely to the direction of gravity, it would, if undisturbed by any other force except gravity, accurately describe a parabola whose axis is vertical and whose vertex is the highest point reached by the body. The term "parabola" is used in analysis, more generally, to denote that class of curves in which some power of the ordinate is proportional to a lower power of the corresponding abscissa. Thus, the common parabola above given has the equation $y^2 = kx$, the cubical parabola has the equation $y = a + bx + cx^2 + dx^3$, the simplest form being $y = kx^3$, and the semicubical parabola, $y = kx^{\frac{3}{2}}$ or $y^2 = kx^3$. The last-mentioned curve is also known as the Neilean parabola, because it was rectified by William Neil (1657).

For the various curves bearing the name "parabola," consult H. Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897; partie complémentaire, 1899). For the general topic, consult any work on analytic geometry.

PARABOLANI (Lat. nom. pl., from Gk. *παράβολος*, *parabolos*, reckless, from *παράβαλλειν*, *paraballein*, to throw beside, to compare). A class of functionaries in the early Church, by some writers reckoned as members of the clergy and included in the minor orders, but more probably religious associations, whose chief duty was to tend the sick, whether in ordinary diseases or in times of pestilence. They received their name from the boldness with which they exposed themselves to danger of contagion. By some the association is believed to have originated at Alexandria in the time of a great pestilence under the Bishop Dionysius in the third century. They were certainly very numerous at Alexandria, amounting to some 500 or 600, but were also enrolled in other churches. We find them at Ephesus, at the time of the council in 449, and at Constantinople under Justinian, who limited their numbers in that city to 950. The Code of Theodosius the Younger (416) limited them in Alexandria to 500 and made them subject to the *Præfectus Augustalis*, but a later decree placed them directly under the authority of the Bishop. They seem to have been mainly from the lower classes and with a tendency to disorder. After the time of Justinian they are not mentioned.

PARABOLOID (from Gk. *παράβολή*, *parabolē*, parabola + *εἶδος*, *eidos*, form). A solid whose surface is generated by a parabola which moves with its vertex always on another parabola, the axes of the two curves being parallel and their planes perpendicular to each other. It has the equation $Ax^2 + By^2 - 2Cz = 0$, or $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2cz$. (See COORDINATES.) If B is positive, the surface is called an *elliptic* paraboloid; if B is negative, a *hyperbolic* paraboloid. The sections of the former made by the coordinate planes, $x = 0$, $y = 0$, are parabolas having a common axis. The section by any plane parallel to $z = 0$ on the positive side is a real ellipse; on the negative side the section is imaginary. The sections of the hyperbolic paraboloid made by the planes $x = 0$, $y = 0$ are parabolas, but the sections made by planes parallel to $z = 0$ are hyperbolas. The section made by the plane $z = 0$ is two intersecting straight lines, the limiting form of the other hyperbolas. The hyperbolic paraboloid is a special case of the hyperboloid of one sheet and hence is a ruled surface. A paraboloid of revolution is formed by revolving a parabola about its principal axis. Its equation is $x^2 + y^2 = 4pz$. Sections of such a figure perpendicular to



HYPERBOLIC PARABOLOID.

the axis of revolution are circles. The term *paraboloidal* is applied to bodies having the general form of a paraboloid, a form commonly found in concave reflecting mirrors. See PARABOLA.

PARACATÚ, pá'rá-ká-tōŭ'. A town of the State of Minas Geraes, Brazil, near the border of the State of Goyaz, situated 450 miles northwest of Rio de Janeiro (Map: Brazil, H 7). The town was founded near the middle of the eighteenth century and was formerly famous for its rich gold washings. Now its chief industries are stock raising and the cultivation of sugar cane and coffee. Pop., about 10,000.

PARACEL'SUS. The assumed name of Philippus Aureolus Paracelsus Theophrastus Bombastus von Hohenheim (1493-1541). A German physician and chemist. He was born at Einsiedeln, Switzerland, the son of a physician and chemist, Wilhelm Bombast von Hohenheim; he received his early education from his father, and at 16 he went to Basel University, but soon abandoned it for the study of chemistry and alchemy under Withemina, Bishop of Würzburg. He traveled widely, sustaining himself by irregular practice and collecting a vast amount of miscellaneous medical knowledge, especially of folk medicine, through associating with barbers, gypsies, and executioners. He served some time as a military surgeon in the Low Countries, Denmark, and Italy, and learned practical metallurgy at the mines in Tirol belonging to the Fugger family, who were cele-

brated for their patronage of art and science. Here he appears to have studied diligently, investigating the processes of preparing metals and making experiments as to their medicinal virtues. His cures, real or pretended, became voiced abroad, and he was called to prescribe for many of the great men of his day. Erasmus was one of his patients. At the recommendation of Oecolampadius he was, in 1526, appointed professor of physic and surgery at Basel, when he inaugurated his career as a teacher by publicly burning the works of Galen and denouncing the Arabian masters, whose teachings were then generally followed. He also flouted tradition by lecturing in German instead of Latin. His defiance of tradition, in addition to his arrogance, vanity, and drunkenness, provoked the most bitter animosity of the regular faculty, and he was compelled to leave the university in 1528. He resumed his wanderings. Wherever he went he excited the regular faculty to a state of violent hatred, not wholly undeserved. At Salzburg he gave offense and was thrown from a window by the servants of a physician, dying from the fall. His grave is in St. Sebastian's Church in Salzburg.

In spite of his turbulent life and charlatan methods, Paracelsus exerted a profound influence upon the medical beliefs of his time and of succeeding centuries. He struck at the weak points of the prevailing system of medicine; he destroyed the "humoral pathology" (which was founded on the belief that diseases depended upon an excess or deficiency of bile, phlegm, or blood), and taught that diseases were actual entities and were to be combated with specific remedies. He improved pharmacy and therapeutics, introduced new remedies (opium, mercury, sulphur, iron, arsenic, etc.), made some new chemical compounds, and strove to reduce the overdosing then practiced. A large number of medical works are attributed to him, many of which were written by his followers, and some, it is declared, by his enemies in order to injure his reputation. Marx admits only 10 as genuine, and Häser 24. His best-known work is *Die grosse Windartzney* (1530). Collected editions of his writings appeared at Basel, Strassburg, Geneva, and Munich. The first English translation was edited by John Hester and appeared in London in 1596 under the title *One Hundred and Fourteenc Experiments and Cures, etc*.

Bibliography. Mook, *Theophrastus Paracelsus, eine kritische Studie* (Würzburg, 1876); K. Sudhoff, *Ein Beitrag zur Bibliographie des Paracelsus im 16. Jahrhundert* (Leipzig, 1893-94); id., *Versuch einer Kritik der Echtheit der paracelsischen Schriften* (Berlin, 1894-99); *The Hermetic and Alchemical Writings of Aureolus Philippus Theophrastus Bombast*, edited by A. E. Waite (2 vols., London, 1894); Hartmann, *Grundriss der Lehren des Theophrastus Paracelsus* (Leipzig, 1898); Franz Hartmann, *Life and Doctrines of Philippus Theophrastus Bombast of Hohenheim* (new ed., New York, 1910); Agnes Bartscherer, *Paracelsus, Paracelsisten und Goethes Faust* (Dortmund, 1911), containing a bibliography. Consult also Robert Brownings' long poem "Paracelsus."

PAR'ACENTE/SIS. (from Gk. *παράκέντησις*, *parakéntesis*, tapping, from *παρά*, *para*, from, beside + *κέντειν*, *kentein*, to prick or to stab). A surgical operation consisting in tapping or

puncturing, with a hollow needle, a cavity of the body, for the evacuation of pus, serum, or other fluids. Paracentesis of the thorax is performed in cases of pleurisy with effusion, of the abdomen in ascites (q.v.), of the pericardium in pericarditis, etc. Paracentesis of the eardrum is at the present time a misnomer; the operation usually performed for the evacuation of pus or serum in the tympanum consists of a free incision with a small knife.

PARACHUTE, pār'a-shōōt' (Fr. *parachute*, from ML. *parare*, to guard against, prevent, Lat. *parare*, to prepare + Fr. *chute*, fall, OF. *cheute*, *cheoite*, It. *caduta*, fall, from Lat. *cadere*, to fall). A device for the purpose of diminishing the velocity of a falling body and used by aeronauts as a means of descending from balloons. The parachute may be likened to a large umbrella. Its invention is accredited to Sebastian Lenormand, and the device was used by him in 1784 in making a descent from an upper window of a house in Lyons. The first descent from a balloon was made by Garnerin in Paris in 1797, in which a parachute, 23 feet in diameter, composed of a number of gores of canvas, was employed. In its usual form the parachute is made of canvas, being attached to the balloon so as to hang loose during the ascent and to spread out and offer a resisting surface as soon as it is separated from the balloon and begins to fall. For a weight of 220 pounds, which includes that of the passenger as well as of the apparatus, it is necessary to have a surface about 40 feet in diameter in order to reduce the velocity to a rate of about 3¼ feet per second. The car or basket is supported by cords attached to the edge of the canvas, and sometimes there is a heavier cord or girth which passes over the top of the parachute and carries the larger part of the weight. There is generally a small opening at the top to allow some of the air to pass out, and this serves to keep the parachute steady in its proper position and prevent swinging.

PAR'ACYAN'OGEN. See CYANOGEN.

PARADE' (Fr. *parade*, show, halt on horseback, from Sp., Portug. *parada*, halt, parade, from *parar*, to halt, prepare, from Lat. *parare*, to prepare; connected with *ἐπὶ*, *eporōn*, I prepared). In its original sense, a prepared ground, but applied also to the courtyard of a castle or fortification and afterward to any inclosed and level stretch of ground. In every barracks, fort, or army post there is a parade ground upon which the regiment assembles and is formed for inspection or ceremony.

A parade is also one of the formal ceremonies prescribed by army and drill regulations for infantry and cavalry. For field artillery parade is not authorized. In the United States army infantry parade is conducted as follows: *General Rules*.—If dismounted, the officer viewing the parade, and his staff, stand at parade rest, with arms folded, while the band is sounding off; they resume attention with the adjutant. If mounted, they remain at attention. At the command "Report," given by a battalion adjutant, the captains in succession from the right salute and report: "A (or other) Company, present or accounted for"; or "A (or other) Company, (so many) officers or enlisted men absent," and resume the "order sabre." At the same command given by the regimental adjutant, the majors similarly report their battalions.

Battalion Parade.—At adjutant's call the battalion is formed in line but not presented. Lieutenants take their posts in front of the centre of their respective platoons at the captain's command for dressing his company on the line. The major takes post at a convenient distance in front of the centre and facing the battalion. The adjutant then commands "Guides, posts"; "Parade, rest"; and "Sound off." At the latter command the band, playing in quick time, passes in front of the line of officers to the left of the line and back. "Retreat" is then sounded by the field music, and, following the last note and while the flag is being lowered, the band plays the "Star-Spangled Banner," the battalion being at "attention." The battalion is then presented to the major, who puts it through such exercises in the manual of arms as he desires. The major then directs the adjutant to receive the reports and publish the orders. All the company officers then form in line, march to within six paces of the major, salute, and receive such instructions as he may give. They then return to their companies, after which the command passes in review. When the last company has passed the ceremony is concluded. Regimental parade is conducted on the same general principles. Cavalry parade is similarly conducted under its own regulations. Consult *Infantry Drill Regulations, United States Army, 1911, amended to 1915* (Washington, 1915).

Parade is also used as a term in fencing, particularly by those of the French school. It is a guard position, designed to meet or parry thrusts, the English equivalent for which is *parry*.

PARADISE (OF., Fr. *paradis*, from Lat. *paradisus*, from Gk. *παράδεισος*, *paradeisos*, park, Paradise, from Avestan, *pairi-daēza*, inclosure). A word found in the Old Testament and in Greek writers from Xenophon on, as a term for the great hunting and pleasure parks of the Persian kings. It is the word translated "forest" in Neh. ii. 8, and that rendered by "orchard" in the Song of Songs iv. 13 and Eccles. ii. 5; this original sense of "park" appears in English literature. The word was adopted by the Greek translators of the Old Testament for the "garden" in Eden (Gen. i. 8, and in other biblical references to Eden, q.v.). The later religious notion is bound up with the Jewish mystical thought concerning the Garden of Eden. This was supposed to be still in existence in some remote and mysteriously inaccessible place (Gen. iii. 24), to which the apocalyptic thought of Judaism, from the second century B.C., added the notion that it was reserved as the future abode of the righteous. This thought is first fully developed by the Book of Enoch (q.v.), which locates Paradise variously—in the west (like the classic Isles of the Blest), in the north (with the Mount of God), or in the east (as in Genesis). According to this first stage of thought Paradise is a place of sensual delight. It was also the abode of the two saints who had been translated from this world, Enoch and Elijah. But the rapid development of eschatology grew impatient of waiting for the Day of Judgment for the decision of the fate of the dead, and in the first century B.C. Paradise became the intermediate abode of all the righteous. Yet a further step took place in the spiritualization of the idea. Just as Jerusalem was supposed to be mystically preserved in the heavens until the

day of redemption (cf. Rev. xxi-xxii), so was Paradise caught up into the celestial spheres, and thither the spirits of the faithful were conveyed upon death. This view appears at length in the Book of the Secrets of Enoch (see ENOCH, BOOKS OF), which locates Paradise in the third of the seven heavens, and is represented in the New Testament by Luke xxiii. 43 (cf. xvi. 23 et seq.) and 2 Cor. xii. 2. At the same time there was uncertainty whether this was the final abode of the saints, Jewish theology requiring the Day of Judgment. In Rev. ii. 7 Paradise seems to be synonymous with heaven. Even in these spiritualized conceptions the imagery of the ancient Garden of Eden appears still in the Tree of Life and the Water of Life. The New Testament does not add to the idea of Paradise, but the Christian doctrine of the return of Christ to consummate his kingdom developed the notion of Paradise as the place of departed saints, where they are supposed to "sleep in Jesus" and at the same time to enjoy mystic fellowship with him and with the saints on earth. In mediæval theology these distinctions are exactly drawn, whereas in most Protestant theology the doctrine of Paradise remains indistinct, and in popular Protestantism Paradise is equivalent to heaven. In Islam the notion of Paradise was taken over and still further sensualized; it remains a garden full of all carnal delights. (See MOHAMMEDANISM.) It is interesting to note that this idea of a garden has always appealed to the Semitic mind, which, accustomed to the desert, takes the well-watered garden as the type of heaven; but Occidental thought has stripped the theological idea of this picturesque connotation. See ESCHATOLOGY; HEAVEN.

Bibliography. K. R. Hagenbach, *History of Christian Doctrines* (Eng. trans., Edinburgh, 1880); Gunkel, *Schöpfung und Chaos* (Göttingen, 1895); S. D. F. Salmond, *The Christian Doctrine of Immortality* (Edinburgh, 1897); R. H. Charles, *Critical History of the Doctrine of the Future Life in Israel, in Judaism, in Christianity*, Jowett Lectures (London, 1899); Wilhelm Bousset, *Die Religion des Judentum im neutestamentlichen Zeitalter* (2d ed., Berlin, 1906); R. P. Knopf, *Die Zukunftshoffnungen des Urchristentums* (ib., 1907); H. B. Sharmar, *Teaching of Jesus about the Future* (Chicago, 1909); E. A. Dobschütz, *Eschatology of the Gospels* (London, 1910); J. A. McCulloch, *Early Christian Visions of the Other World* (Edinburgh, 1912).

PARADISE LOST. An epic poem by John Milton, published in 1667. The idea of a great epic had filled Milton's mind for many years; at first the legend of King Arthur attracted him, but he chose at last the story of the fall of man, attempted in English by Cædmon and Fletcher. Milton may have been influenced by Andreini's drama *Adamo*, about 1640, and Joost van Vondel's drama *Lucifer*, 1654.

PARADISE OF FOOLS, THE. One of the four divisions of Limbo, the *Limbus Patuorum*, reserved for fools, idiots, and lunatics; but at present the term denotes the state of mind of one who frequently indulges in vain hopes and expectations.

PARADISE REGAINED. A poem by John Milton (1671). It supplements the *Paradise Lost*, but is written in a colder, more severe style. It is, in fact, a paraphrase of the narrative of the Temptation in the Gospels, a dra-

matic dialogue between two voices, good and evil.

PARADISO, pǎ'rǎ-dě'zô, IL (It., The Paradise). The last part of Dante's *Divine Comedy*.
PARADOL, LUCIEN ANATOLE PRÉVOST. See PRÉVOST-PARADOL, L. A

PARADOXIDES, pǎr'ǎ-dôx'f-děz (Neo-Lat nom. pl., from Gk *παράδοξος*, *paradoxos*, incredible, from *παρά*, *para*, beside, beyond + *δόξα*, *doxa*, opinion, belief, from *δοkein*, *dokim*, to seem). An important and characteristic fossil trilobite of the Middle Cambrian rocks of North America, Europe, and Australia. The animal has a flat, long, tapering shield, with large arcuate head shield and 16 to 20 thoracic segments, and a small round tail shield or pygidium. The eyes are narrow, of crescentic outline, and not prominent, and the posterior lateral angles of the head are usually furnished with long spines. The best-known species, *Paradoxides harlani*, found in the sandy shales of the Cambrian in eastern Massachusetts, sometimes attains a length of 20 inches, with a width across the head of over 10 inches. Finely preserved specimens of other species of Paradoxides are found in the limestone nodules of the Cambrian shales of New Brunswick, Canada, and Newfoundland. See TRILOBITA

PARADOXURE. See PALM CIVET.

PARÆSTHESIA. See FORMICATION.

PARAFFIN (Fr *paraffine*, from Lat. *parum*, little + *affinis*, akin, from *ad*, to + *finis*, end). A hard, white, waxlike substance largely used for the manufacture of candles, a small amount of stearin being added to render the candles translucent. Paraffin is used, besides, in making matches, in preserving meat and wood, to improve the quality of timber employed as fuel, to render fabrics waterproof, etc. It occurs naturally in the mineral ozocerite, which was formerly the chief source of the substance. The manufacture of paraffin has developed into an important industry since 1851, when it was founded by James Young, a Scottish chemist. At present considerable quantities of paraffin are made in Germany by distilling certain varieties of brown coal. In Scotland, the chief seat of the industry, it is made from boghead coal and certain bituminous shales. When the shale is subjected to a process of destructive distillations, a green oily liquid passes over, which contains a large amount of paraffin in solution. This crude oil is washed with sulphuric acid and with caustic soda and is divided into more and less volatile fractions by further distillation. Most of the paraffin is contained in the heavy, nonvolatile fractions, and when the latter are let stand for some time at a sufficiently low temperature, the paraffin separates out in the form of a crystalline mass. The crude product is purified by washing with benzene and decolorized by heating with waste coal. At the present time paraffin is largely recovered from the residuum of petroleum (q.v.) distillation. Chemically paraffin is a mixture of the higher aliphatic hydrocarbons (see HYDROCARBONS), the relative composition of the mixture is not always the same, and the melting temperature varies with the product, being anywhere between 45° C and 90° C. Paraffin has neither taste nor odor, it is insoluble in and lighter than water.

Among the useful by-products obtained in the manufacture of paraffin are benzine (not benzene), asphalt, and paraffin oil. Paraffin oil yields oil gas, which has a very high illuminat-

ing power and is used to enrich ordinary coal gas; it is largely used also for lighting ships, railroad cars, etc.

PARAFFIN, NATIVE. See OZOCERITE.

PARAFFIN PAPER. See PAPER.

PARAFFINS. See HYDROCARBONS.

PARAGLOBULIN. See GLOBULINS.

PARAGOGE, pǎr'ǎ-gô'jê. See ETYMOLOGY. FIGURES OF

PARAGOULD, pǎr'ǎ-gôûld. A city and the county seat of Greene Co., Ark., 160 miles northeast of Little Rock, on the St. Louis Southwestern and the St. Louis, Iron Mountain, and Southern railroads (Map Arkansas, E 1). It contains a fine government building and a sanitarium. There are five large stove factories, a roller mill, pottery, hardwood mills, etc. Paragould is an important lumber shipping point. The water works are owned by the city. Pop., 1910, 5248.

PARAGUA, pǎr'ǎ-gwǎ. The old Spanish name of the island of Palawan, Philippines, and the present name of the province forming the north half of the island (Map Philippine Islands, B 6). Area, 1635 square miles. See PALAWAN.

PARAGUARI, pǎr'ǎ-gwa-rê'. A town of the department of the same name, Paraguay, 30 miles southeast of Asunción, on the railway leading from that place to Encarnación (Map: Paraguay, H 3). It is the centre of traffic for the surrounding region, which is chiefly engaged in tobacco culture. Paraguarí was founded in 1775. Pop. (est.), 10,000.

PARAGUAY, pǎr'ǎ-gwǎ or pǎr'ǎ-gwî'. An inland republic of South America, bounded on the north by Bolivia and Brazil, on the west and south by Argentina, and on the east by Argentina and Brazil. The tropic of Capricorn crosses the country, of which one-third is in the torrid and the remainder in the south temperate zone. It has an estimated area of 171,815 square miles. The Paraná River forms a large part of the east boundary. The country is divided by the Paraguay River into two sections: (1) east Paraguay (Paraguay proper), between the Paraguay and Paraná rivers, which has attained considerable development, (2) the part of the Gran Chaco belonging to the Republic, between the Paraguay and the Pilcomayo, which forms a portion of the west boundary. Few enterprises of the white race have yet been carried into the latter region.

Topography. East Paraguay is a plateau of no great elevation surmounted by low ridges and hills and subsiding in the west and southwest to grassy tracts, morasses, and lagoons, which scarcely rise above the fluvial level. The plateau has an average altitude of less than 300 feet above sea level, and the hills and ridges rarely exceed 1600 feet in height. The term "mountains" can hardly be assigned to these hills. Slightly undulating plains skirt the east bank of the Paraguay, but away from the river the hills soon become numerous and higher. Chains of low heights extend north and south through the country and are hyperbolically called sierras and cordilleras, though hunters and maté gatherers easily pass from one slope to the other. The fact that much of the interior is still little known is due not to these low ridges, but to the dense tangle of vegetation covering their slopes. The Gran Chaco west of the Paraguay River is mainly an immense level plain with a very slight slope towards the river.

and with large areas subject to frequent inundations.

Hydrography. Between the low ranges flow innumerable rivulets and streams. The whole country is divided into two fluvial basins, the Paraná system to the east and the Paraguay system to the west. While the Paraná is one of the largest rivers of the world and the Paraguay is its tributary, the former is of much less importance than the latter in the country's industrial development. Life, energy, and progress are chiefly centred in the valley of the Paraguay and especially on its east shore. Of great depth, unvarying in current and velocity, and containing an immense volume of water, it can at all times be navigated by the largest vessels, so that it forms a highway of trade into the heart of the continent. The Pilcomayo is the chief affluent of the Paraguay. It is navigable on the Bolivian frontier as well as in its lower reaches, but not in the middle course, where the current through the level plain is too feeble to excavate a deep channel.

Climate. The country has a subtropical climate, with the heat tempered by many refreshing breezes from the south. The average temperature is 70° F. That of the summer months (December, January, and February) ranges from about 55° F to 100° F. From May to August (winter) it occasionally falls to about 40° F., but during the day is frequently 86° F. Nine of the 12 months may be said to be perpetual spring, the other three months being very hot. The average annual rainfall at Asunción is 60.5 inches, while that of the whole country amounts to about 50 inches, distributed over about one-fourth of the days of the year. The rainy season is chiefly confined to the period between August and October, and, as the amount of precipitation shows, it cannot be compared with what is usually called the rainy season in tropical countries. The climate is healthful and produces no bad effects upon the European immigrant.

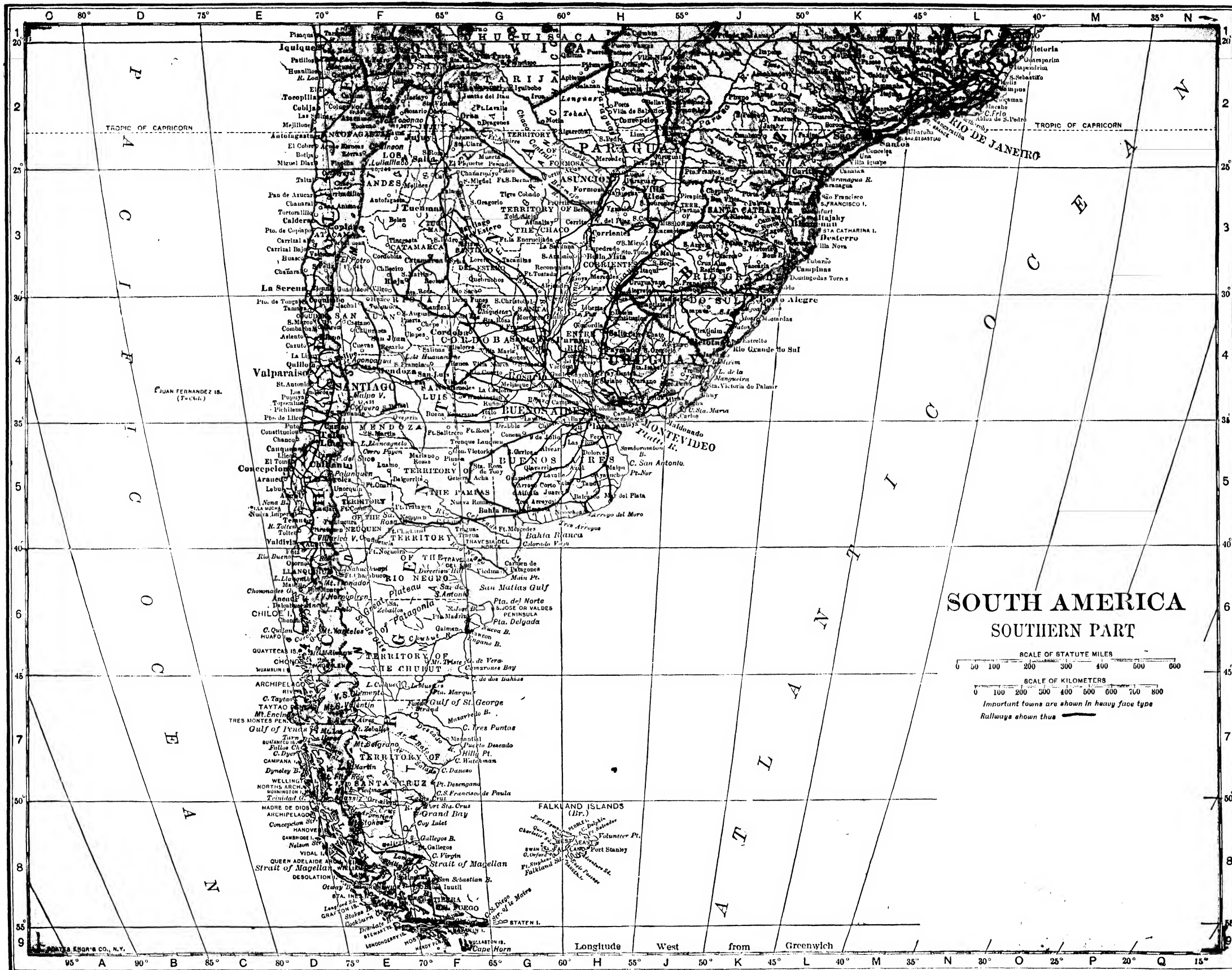
Flora. The Paraguay River divides the country into well-defined botanical regions. In east Paraguay the prevailing feature of hill and valley is virgin forests with majestic trees, tangled lianas, and brilliant flowers, among the forests are interspersed wide tracts of pasture covered with tall grass, and pindo and mbocaya palms crowning many hills. There are also groves of orange trees whose fruitage never fails, clumps of bananas, and the large bush of the timbo, a leguminous plant. The Chaco, west of the river, on the other hand, presents the bare aspect of a heath occasionally marshy or dotted over with yataí palms, on rising ground thrive dense quebracho forests. The excellence of Paraguayan timber, both for building and cabinet-making, is far-famed. The density of many of these woods is so great that they will not float; but lighter woods, such as are needed for ordinary carpenter work, are not lacking. The forests also supply dyestuffs and many medicinal plants. Perhaps the most characteristic vegetable product is yerba maté (see *Agriculture*, below).

Fauna. Among the wild animals are the jaguar, the most formidable of the carnivora, the American lion or puma, the tiger cat, the marten, polecat, tapir, peccary, and deer. Saurians swarm throughout the country. The alligator of the Paraná is strong and large, but not so fierce as that of the Amazon. Though the

venomous snakes include the rattlesnake, viper, and cobra, few cases of snake bite occur, largely because of the great caution of the Paraguayans. The boas are enormous, but singularly inoffensive. Paraguay can boast of some of the most beautiful birds in the world. No family is unrepresented, from the enormous wading birds to the tiniest of humming birds. In the wilderness flies, gnats, and other pests are very annoying, but, strange to say, they give little trouble in the cultivated districts.

Geology. Broadly speaking, limestones predominate in north Paraguay as far south as lat. 22° S, while sandstones prevail in most of the hilly regions of the south, the plains being formed of argillaceous beds and sandy stones belonging to the Tertiary epoch. In some districts volcano cones are seen. The hills and ridges are due to great dislocation of the rocks occurring long before the mighty upheaval of the Andean Cordilleras, but the present elevations are only the ruins of former lofty summits which have been degraded by long denudation. Little use is yet made of the mineral resources, though iron ore is widely distributed, marble is abundant in the north, and copper and other valuable minerals are found.

Agriculture, etc. The soil in Paraguay is generally good. Farming is the chief pursuit, but is in a very backward condition. Only about 300,000 acres are under cultivation, chiefly along the rivers, where transportation is easy. Owing to the fact that the state owns the public lands and for a long period sold large areas to capitalists and syndicates, the price of the lands most favorably situated for farming or stock raising was high, and this helped to retard the development of agriculture. Large tracts of country also have been assigned to the holders of Paraguayan bonds as security for the national debt, and many a peasant pays rent to foreign owners of land. An important crop is maté (*Ilex paraguayensis*), whose withered leaves are used as tea, the beverage being very popular in Paraguay, Brazil, Argentina, and some other South American countries. Its stimulant properties resemble those of coffee and tea. Half of the crop is consumed at home. The crop is gathered from the wild shrub in the forest or from the cultivated plant, and though the adjacent districts of Brazil also produce it, that of Paraguay is superior in quality. The native orange trees yield an enormous crop. Almost every house has its orange grove. Immense quantities are exported. Maize, the great cereal crop, is the staple food. Wheat, rice, and other cereals are raised, but not in sufficient quantities to supply the home demand. Tobacco is a large crop, it is consumed in enormous quantities and is an important export. Among other vegetable products are sugar cane, coffee, cotton, and ramie. Stock breeding has not yet attained its proper development, but the number of cattle is increasing and in 1914 was estimated at 4,000,000. Good grazing lands are abundant in east Paraguay, and ranches are being opened on the plains of the Gran Chaco. The cattle are used chiefly for meat (including jerked beef) and for hides, which are a large export. Among the numerous forest products the *Quebracho colorado*, now found only in the Chaco, is most important. Its bark, which is very rich in tannin, is used for tanning, and its wood for railroad ties and other purposes. The export of forest products for Europe and other parts of



the world is increasing, though the difficulty of carrying them to the Paraguay and Paraná rivers for shipment is still great. Paraguayan woods for piles in the harbor works of Argentina and Uruguay and for railroad ties are in large demand.

Manufactures. The country has made little advance in general industries. There is some manufacture of spirits from sugar cane and also of sugar, leather, cigars, brick, furniture, etc. The principal manufactures are in Asunción. Many of the Indians, under the tuition of the Jesuits, have become skilled in various trades.

Commerce. The reported values of imports and exports have been as follows, in thousands of pesos gold (1 peso = 96.47 cents):

	1906	1908	1910	1912	1913	1914
Imports.....	6267	4073	6248	5283	8120	5149
Exports.....	2695	3732	4785	4211	5631	4584

The largest imports are cotton goods, food-stuffs, and hardware. Leading exports in 1912: fresh fruits, 1,284,000 pesos; hides, 1,083,000; woods, 877,000; maté, 501,000; tobacco, 442,000. There is a considerable export of quebracho extract. In 1912 Germany stood first in the import trade, the United Kingdom second, and Argentina third; in the export trade, Argentina first (more than one-half), Germany second, and Uruguay third. Exports to other countries are relatively unimportant. It should be noted, however, that many of the exports to Argentina and Uruguay are reexported to Europe and the United States.

Transportation and Communications. Four fairly good roads lead from Asunción to various parts of the country. With these exceptions there are scarcely any wagon roads, and land transportation is difficult and costly. A number of the tributaries of the Paraná and Paraguay are important in the transportation of forest products to those rivers, but the stage of water in them is often too low for navigation. Thus it is very difficult at times to deliver a part of the maté crop at the large rivers for shipment. The traffic of the country is centred on its two great rivers, the Paraguay carrying the larger part of it. Some of the largest river steamers in the world ply between Asunción and Buenos Aires. The length of railway in operation in 1913 was 468 kilometers (291 miles). Asunción is connected by rail with Buenos Aires. The first through train left the latter city Oct. 3, 1913, on a 50-hour schedule. The distance by rail between the two cities is 1518 kilometers, of which 376 kilometers are Paraguayan. Trains are ferried across the upper Paraná between the Argentine town of Posadas and the Paraguayan town of Encarnación. During 1914 and 1915 a branch was under construction eastward from Borja, a town a short distance south of Villa Rica; it is planned to extend this line to a point on the upper Paraná opposite the Brazilian town of Iguassú. There are about 2500 miles of telegraph line and 385 post offices.

Government. The present constitution was adopted by a popularly elected convention of 60 delegates which met at Asunción on Aug. 15, 1870. The government is that of a centralized republic. The legislative power is vested in a Congress consisting of a Senate and a Chamber of Deputies. Both Senators and Deputies are

chosen by popular vote. The executive power is vested in a President chosen for four years by an electoral college. He is eligible to reelection only after an interval of eight years. He is aided in the exercise of his functions by a responsible ministry of five members. In case of death or incapacity of the President he is succeeded by a Vice President, who is ex-officio President of the Senate. The judicial power is vested in a supreme court, consisting of two associate justices and one chief justice; five inferior courts; and a series of magistrates' courts, of which there is one in each town of importance. The justices are appointed by the President with the consent of the Senate for a term of four years. The powers of the executive and of Congress, the guaranties in behalf of civil liberty, the provision for amending the constitution, etc., are quite similar to those in the Constitution of the United States. Capital, Asunción (q.v.).

Finance. The revenues and expenditures are small as compared with those of most other countries. The budget for 1913 showed estimated revenue of 3,248,000 pesos gold and 21,688,000 pesos paper, and estimated expenditure of 1,863,000 pesos gold and 48,307,000 pesos paper; for 1914, estimated revenue of 3,860,000 pesos gold and 28,185,000 pesos paper, and estimated expenditure of 1,768,000 pesos gold and 67,090,000 pesos paper. The gold unit of value is equivalent to 96.47 cents; the paper peso was worth about 7 cents in 1913 and about 5 cents in 1914. The principal sources of revenue are import duties (estimated at 2,616,000 pesos gold for 1914), export duties (837,000 pesos gold), and direct taxes (20,093,000 pesos paper).

Paraguay incurred a large foreign debt chiefly on account of prolonged civil wars. As a result of the country's failure at times to meet its obligations, it has been necessary to make arrangements for scaling the debt and reducing the interest. The debt in 1874 amounted to \$7,527,000 (gold), but it was agreed in 1885 that in exchange for this debt new bonds to the amount of \$4,250,000 should be issued. An arrangement was also made for the future payment of interest, and land was assigned to creditors in payment of arrears of interest up to July, 1886. The holders of these unpaid interest coupons received land warrants, and the Paraguay Land Company, later known as the Anglo-Paraguayan Land Company, was formed to deal with these warrants. Another arrangement was made with the bondholders in 1895 for the reduction of interest, refunding of interest coupons in arrears, the creation of a sinking fund, and the assignment of securities. The outstanding public debt, as reported for Dec. 31, 1913, was 4,958,773 pesos gold and 81,741,150 pesos paper, made up as follows: foreign debt, 3,914,138 pesos gold; internal debt, 349,120 gold and 67,744,260 paper (including outstanding paper money); floating debt, 695,515 gold and 13,996,890 paper.

The principal banks are the Bank of the Republic, opened in 1908 with a capital of 6,000,000 pesos gold; the Mercantile Bank, capital 20,000,000 pesos paper; and the Agricultural Bank, capital 14,531,000 pesos paper. With the exception of a few small nickel coins, paper is the only circulating medium.

Both the metric system (legal since 1866) and the old Spanish system of weights and measures are in use.

Defense. The regular army numbers about

100 officers and 2500 men, trained after the German model. The infantry is armed with the Mauser rifle. A compulsory-service law (two years) became operative in 1914. The navy includes one small dispatch boat and two steam transports.

Population. The population of Paraguay cannot be stated with accuracy. A census of 1899 returned 643,852 inhabitants. An estimate of 1911 was 800,000, exclusive of some 50,000 Indians in the Chaco; but some observers believe that this figure is too large. The population in Paraguay proper is largely a mixture of Guaraní, Spanish, and negro; there are also many persons of pure, or nearly pure, Guaraní blood. The Paraguayans are a hospitable, well-meaning people, whose prosperity has been greatly retarded by terrible misrule. Foreigners number between 20,000 and 30,000, about one-half being Italians and one-third Argentines. The largest town is the capital, Asunción, whose population in 1914 was reported to be "rapidly approaching 100,000": Villa Rica, about 90 miles southeast of Asunción, is supposed to have some 30,000 inhabitants; Concepción, about 135 miles north of Asunción, 25,000; Carapegua and Luque, 15,000 each; Paraguari and Villa del Pilar, 10,000 each.

Although encouraged by the government, immigration is small, owing partly to the troubled history of the country, the alienation of large blocks of lands to syndicates, and the nearer opportunities presented by Argentina. Immigrants from 1882 to 1910 numbered 18,360; in 1910-11, 418; in 1911-12, 605.

Education and Religion. Primary instruction is free and nominally compulsory, but schools are not everywhere available, and probably only about one-fifth of the adult population can read and write. Public schools are reported to number about 800, with some 50,000 pupils. In addition, there are a number of private schools, some being subsidized by the government, and a few private Protestant schools. There are two agricultural schools. At Asunción is a national college, with over 500 students. Roman Catholicism is the state religion, but the public exercise of other worship is permitted. The law of civil marriage was introduced in 1898.

History. The native inhabitants of the region above the junction of the Paraná and the Paraguay rivers belong to the warlike race of the Guaraní (q.v.). The country was first explored in 1526 by Sebastian Cabot, who made his way for several hundred miles up the course of these two streams. In 1529-30 Diego García entered the same region, and in 1536 Juan de Ayolas laid the foundation of a town at Asunción. He was murdered by the natives, but Martínez Irala, who succeeded him, soon put the colony in a prosperous condition, and it promised to become one of the most important in South America. His power was largely personal, however, and after his death a period of anarchy ensued, which effectually destroyed Spanish influence over the natives. The country was considered as a dependency of the Viceroyalty of Peru, which exercised, however, little more than nominal oversight. The history of Paraguay is chiefly remarkable for the long civil and religious domination of the Jesuits, extending from 1609 to 1768. The missions—or reductions, as they were called—were not only centres of education and civilization, skillfully directed to appeal

to the habits and imagination of the natives, but they were refuges from the rapacity and oppression of the Spanish conquerors, and as such acquired an influence and moral ascendancy in many ways analogous to that exercised by the monasteries of Europe in the early Middle Ages. The disciplinary rule of the Jesuits was thorough. They instituted a penal code with carefully graduated penalties and established large schools for the education of the children. The economic character of the reductions was largely communal, in keeping with native customs and traditions. After the expulsion of the Jesuits the missions soon became deserted. At that time (1768) there were in the various Jesuit stations some 400,000 natives. In 1776 Paraguay was included in the Viceroyalty of Río de la Plata. The Spanish government was overthrown in 1811. The last governor quietly resigned his office, and his place was taken by a triumvirate, one of whose members was José Gaspar Francia (q.v.). In 1816 Francia was made dictator and ruled the country with absolute power until his death, in 1840. His rule was based on a policy of national isolation. He attempted to cut off all intercourse with other states and actually closed the Paraguay River to navigation. In the congress which was assembled to provide a new executive, Carlos Antonio López (q.v.) became the dominant figure. In 1844 he was named President for 10 years, but succeeded to all the absolute power of Francia. His dictatorial policy, however, was somewhat milder. He adopted many liberal reforms, attempted to form a constitution, and abandoned the policy of isolation. At his death, in 1862, he was succeeded by his son, Francisco Solano López (q.v.). The younger López was an ambitious despot, and with the idea of forming an empire he plunged the country into a disastrous five years' war with Argentina, Brazil, and Uruguay. The struggle exhausted the country, decimated the male population, and was terminated with the death of López at Aquidaban, in 1870. After the establishment of peace and the withdrawal of the allied armies a liberal constitution was adopted, and the painful process of the regeneration of the country began. The Republic has been rather free from revolutions since 1870, a fact which has contributed to the nation's progress. The significant feature of the history of the country during recent years has been the agricultural and railway development rather than political activity. President Benigno Ferreira was overthrown in 1908 and was succeeded by Vice President Emiliano González Navero. Civil war occurred during 1911-12, but in the latter year Eduardo Schaerer assumed the presidency and inaugurated an epoch of peace. Reforms were made in the administration of the laws, and measures were taken to continue peace and secure prosperity.

Bibliography. General description: Alfred Demersay, *Histoire physique, économique, et politique du Paraguay* (3 vols., Paris, 1860-64); A. M. Du Graty, *La république de Paraguay* (2d ed., Brussels, 1865); Clemens, *La Plata Countries of South America* (Philadelphia, 1886); Criado, *La república del Paraguay*, (Asunción, 1888); Braine-le-Conte, *La république du Paraguay* (Bordeaux, 1889); Mulhall de Bourgade, *Paraguay* (London, 1892); E. de Bourgade La Dardye, *Paraguay, the Land and the People*, English translation by E. G. Ravenstein (London, 1892); Van Bruvssel, *La répub-*

lique du Paraguay (Brussels, 1893); Olascoaga, *Paraguay*, translated from Reclus, *Géographie universelle* (Asunción, 1896); C. R. Santos, *La república del Paraguay* (ib., 1897); "Paraguay," in International Bureau of American Republics, *Publications*, No. 16 (Washington, 1909); H. F. Decoud, *Geografía de la república del Paraguay* (Leipzig, 1911); A. L. Decoud, *Album gráfico del Paraguay* (Asunción, 1911); M. R. Hardy, *Paraguay* (New York, 1913). History: J. P. and W. P. Robertson, *Letters on Paraguay* (2 vols., London, 1838); T. J. Page, *La Plata, the Argentine Confederation, and Paraguay* (New York, 1859); T. J. Hutchinson, *The Paraná* (London, 1868); George Thompson, *The War in Paraguay* (ib., 1869); R. F. Burton, *Letters from the Battlefields of Paraguay* (ib., 1870); C. A. Washburn, *History of Paraguay* (Boston, 1871); Blas Garay, *La revolución de la independencia del Paraguay* (Madrid, 1897); J. S. Decoud (comp.), *List of Books, Magazine Articles, and Maps Relating to Paraguay* (Washington, 1904); Bartolomé Mitre, "Guerra del Paraguay," in *Archivo*, vols. iii-vi (Buenos Aires, 1911-13).

PARAGUAY RIVER. A river of South America, the largest tributary of the Paraná (qv). It rises on the plateau of Matto Grosso and flows in a general southward direction, at first wholly in Brazil, then on the boundary between Brazil and Bolivia, then through the centre of Paraguay, and finally, below Asunción, on the boundary between Paraguay and Argentina until it joins the Paraná near Corrientes (Map: Paraguay, H 2). Its total length is about 1500 miles. Its sources are a series of lakes called As Sete Lagoas, which are believed to be also the source of a head stream of the Tapajoz, which flows into the Amazon. After leaving the plateau in a series of rapids the river flows for the rest of its course with a tranquil current over an almost level bed through the great plains known as the Gran Chaco and the Pampas. The upper part of this plain above the Bolivian frontier forms the marshes called the Laguna de los Charayes (Charayes). This tract is converted during the annual floods into a vast lake over 100 miles wide and several hundred miles long, leaving exposed only a few islands and the rows of trees which line the banks of the permanent streams. Below the Charayes the river is again confined to its banks by spurs of the plateau, and farther south its bed is so deeply cut into the plain that the latter generally escapes inundation. Below Asunción, however, the banks again become marshy. From the escarpment of the plateau to the confluence with the Paraná, a distance of 900 miles, the river is entirely free from obstructions and is navigable at all seasons for small vessels, which can also ascend the São Lourenço to Cuyabá in Brazil. Steamers drawing 9 feet can at all seasons reach Corumbá at the south end of the Charayes, and the river is the principal commercial outlet for Matto Grosso and Paraguay. Two lines of river steamers ply regularly between Asunción and Buenos Aires, and many ocean-going vessels enter the former port each year. The longest tributaries of the Paraguay are the Pilcomayo and the Berhejo. The river was discovered by Sebastian Cabot, who in 1526 ascended the Paraná as far as the confluence.

PARAGUAY TEA. A South American shrub. See BEVERAGE PLANTS. MATÉ
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PAR'AHÉLIOTROPISM (from Gk. *παρά, para*, about + *ἥλιος, hēlios*, sun + *τροπή, tropē*, a turning, from *τρέπειν, trepein*, to turn). A sensitiveness of plant organs, especially of leaves, by virtue of which they take the position of least illumination when exposed to intense light. Paraheliotropic leaves may turn their tips either towards or away from the source of light. In either case the response brings the plane of the leaf parallel to the direction of the incident light rays. Thus the leaf is much less strongly illuminated than in the diheliotropic position, at right angles to this direction. Many plants of the pea family show this response on bright days in summer. See HELIOTROPISM. TROPISM.

PARAHYBA, or **PARAHIBA**, pi'râ-ê'ibá. One of the smaller states of Brazil, lying in the easternmost part of the country and bounded by the State of Rio Grande do Norte on the north, the Atlantic Ocean on the east, Pernambuco on the south, and Ceará on the west (Map: Brazil, K 5). Area, 21,620 square miles. The surface is low and undulating on the coast, but the greater part consists of an elevated plateau whose slopes are heavily forested. The climate is hot, dry, and healthful, but the soil in the interior supports only a scanty vegetation. Agriculture is the chief industry and is carried on along the coast. Cotton is the principal product. Parahyba ranks second among the states of Brazil in the production of this article. Sugar cane, coffee, coconuts, tobacco, and cereals also are raised. Pop., 1913 (est.), 558,550, consisting largely of Indians and negroes. The capital is Parahyba (qv).

PARAHYBA, or **PARAHIBA**. The capital of the State of Parahyba, Brazil, situated on the river of the same name, about 10 miles from the sea and 50 miles north of Pernambuco (Map: Brazil, L 5). The town lies partly on hills and partly in a plain, the former section is the old city and has dwindled away, while the newer portion, along the river, forms, with its port of Cabedello, the business quarter. The most notable structures are the cathedral and a former Jesuit college, which contains the state offices. The harbor of Cabedello is deep enough for vessels of 15-foot draft, and from it sugar and cotton are exported. Pop. (est.), 35,000. Parahyba was founded by the Portuguese in 1579, being one of the oldest settlements of Brazil.

PAR'ALACTIC ACID. See LACTIC ACID.

PARAL'DEHYDE (from Gk. *παρά, para*, beside + Eng. *aldehyde*, clipped form of Neo-Lat. *alcohol dehyd-rogenatum*, alcohol deprived of hydrogen). A polymeric form of aldehyde with the symbol $C_6H_8O_4$, occurring as a colorless or pale-yellow oily liquid, moderately soluble in water and freely in ether and alcohol. It is obtained by treating aldehyde with dilute sulphuric acid or dilute nitric acid. In medicine it is used as a hypnotic (see HYPNOTICS) principally, rarely as a diuretic and antispasmodic. Excitement follows its use, which is succeeded by sound and refreshing sleep, without digestive or cerebral disturbance. It does not weaken the heart's action. Its disagreeable taste and its tendency to impart an offensive and persistent odor to the breath are serious drawbacks. Its frequent use may result in the formation of a habit. See ALDEHYDE.

PAR'ALLAX (from Gk. *παράλλαξις, parallaxis*, alternation, from *παλλάσσειν, parallassein*, to make alternate, from *παρά, para*, beside

+ ἀλλάσσειν, *allassein*, to alter, from ἄλλος, *allos*, other). The apparent displacement of an object caused by a change of place of the observer. When an object at *M* (Fig. 1) is looked at from



FIG. 1.

P, it appears in line with some other object, *S*, but, after the observer has moved to *E*, *M* has apparently retrograded to a position in line with *S'*; this apparent retrogression is called *parallax*. The angle *PME* is called the *angle of parallax* and is the measure of the amount of parallax. To astronomers the determination of the parallax of the heavenly bodies is of the greatest importance, for two reasons—first, from the necessity of referring all observations to the earth's centre, i.e. so modifying them as to make it appear as if they had been actually made at the earth's centre, and secondly, because parallax is our only means of determining the magnitude and distance of the heavenly bodies. The *geocentric* parallax, the apparent displacement of a heavenly body due to its being observed from a point on the surface of the earth instead of from its centre, may be determined as follows: Let *P* and *P'* be two stations on the surface of the earth (Fig. 2), *E* its centre, *M* the object to be

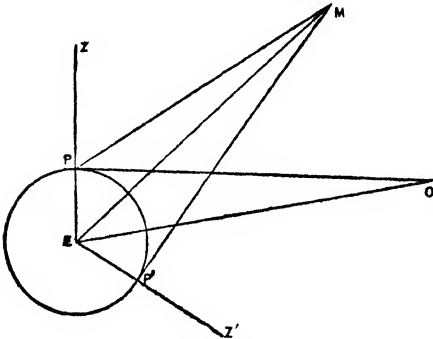


FIG. 2.

observed, and *Z* and *Z'* the zeniths respectively of the observers at *P* and *P'*; then at *P* and *P'* let the zenith distances, *ZPM* and *Z'P'M*, be observed simultaneously, and since the latitudes of *P* and *P'*, and consequently the angle *PEP'*, are known, from these three the angle *PMP'* (the sum of the parallaxes at *P* and *P'*) is at once found; and then by trigonometry the separate angles or parallaxes *PME* and *P'ME*. When the parallax of *M*, as observed from *P*, is known, its distance from *E*, the centre of the earth, can be at once found in terms of the earth's radius as a unit. When the heavenly body is on the horizon, as at *O*, its geocentric parallax is a maximum and is known as the *horizontal parallax*.

In the case of the fixed stars, which are so far away that to them the earth's radius subtends only an infinitesimal angle, it becomes necessary to make use of a much larger base line than the earth's radius, and, as the largest we can employ is the radius of the earth's orbit, it accordingly is made use of, and the displacement of a star, when observed from a point in the

earth's orbit instead of from its centre, the sun, is called the *annual* or *heliocentric* parallax. Here the base line, instead, as in the former case, of being 4000 miles, is about 92,800,000 miles, and the two observations necessary to determine the parallactic angle are made from two points on opposite sides of the earth's orbit, at an interval as nearly as possible of half a year. Yet, notwithstanding the enormous length of the base line, it bears so small a proportion to the distances of the stars that only in a few cases have they been found to exhibit any parallactic motion whatever, and in no case does the angle of parallax amount to 1". See *STAR*.

Solar Parallax. The extremely precise determination of this quantity is very important, since the solar parallax is our only means of determining the distance of the sun from the earth. This is the fundamental unit of distance in astronomy. Upon it depend directly all our notions as to the magnitude and distance of the other members of the solar system and of the universe in general. The solar parallax problem is not only the most important one in fundamental astronomy, but it is also, perhaps, the one offering the greatest difficulty in solution. Astronomical instruments enable us to submit to actual measurement only the directions in space of the heavenly bodies, never their distances. These latter must be obtained by computation from measured directions or angles, and for this purpose some base line is indispensable. The largest possible terrestrial base line is, of course, a diameter of the earth. Yet so small is even this, compared with the distance of the sun, that it would subtend an angle of only about 18 seconds of arc to an imaginary observer at the sun's centre. When we reflect that an angle of one second corresponds to only three-tenths of an inch at a distance of one mile, we get some idea of the extreme minuteness of the earth's diameter as seen from the sun.

It is never possible, of course, to get a *complete* diameter of the earth for a base line, but extraordinary efforts have been made to come as near as possible to this ideal condition. For many years observations of transits of Venus were considered the most favorable means of measuring the small angular differences of direction of the sun's centre as seen from opposite sides of the earth. No expense was spared, especially at the transits of 1874 and 1882, to secure very complete observations. Yet, although the various civilized governments of the world sent out numerous and most elaborately equipped observing expeditions, the whole operation turned out practically a failure. It was simply impossible by this method to secure observations of the requisite precision. Of late years two other methods have been pretty generally agreed upon as the best. The first is based upon the so-called constant of the aberration of light. (See *ABERRATION OF LIGHT*) It is known that the directions in which we see the stars are apparently thrown forward towards that point on the sky to which the orbital motion of the earth is carrying the observer. It is a phenomenon analogous to the well-known fact that if a man be running in a rainstorm the falling drops *seem* to slant towards him, though they may really be falling vertically. So their direction seems to be thrown forward in the direction of the observer's motion. In the case of the earth's orbital motion around the sun the observer will be moving in opposite directions in space at intervals of

half a year. Consequently the effect of aberration is reversed, and the so-called "constant" or amount of aberration admits of determination from the differences of observations made six months apart. The solar parallax can then be computed from the aberration constant, since we know with quite sufficient precision the velocity of the transmission of light in space. The determinations made by this method have been principally in connection with the study of latitude variation.

The other accredited method of determining the parallax is by observations of the planetoids. The method is extremely simple in practice and also very accurate. It is necessary merely to await a time when one of these little bodies is favorably situated for observation and then to fix its position telescopically with respect to the neighboring stars. Let this be done simultaneously at two observatories situated very far apart on the earth and using, of course, the same stars in both places. Then it is clear that the position determined for the planet will not be quite the same at the two observatories. The base line is the straight line joining the two observatories. As a result we obtain directly the distance of the planet from the earth, in terms of this base line as a unit. But this is known in miles from existing geodetic surveys of the earth. Thus we arrive at a knowledge, in miles, of the planetoid's distance. But from the ordinary processes of astronomical observation we know the elements (q.v.) of the planetoid's orbit. We can find from these, by a simple computation based on Kepler's laws, the distance of the planetoid from the earth in terms of the latter's distance from the sun. Knowing then the distance between the earth and planetoid in miles from the special parallax observations, and in terms of the distance "earth sun" from theory, we can at once deduce the value of the latter distance in miles. This, combined with our knowledge from geodesy of the terrestrial radius in miles, enables us to compute the angle subtended by that radius to an observer in the sun—in other words, the solar parallax.

The planetoid method was put in operation by no less than 25 observatories, at which observations were made on the planetoids Iris, Sappho, and Victoria. By thus increasing the number of observation stations the precision of the final result could not fail to be greatly enhanced. The entire "campaign" was planned and managed by Gill, of the Cape of Good Hope Observatory. The observatories taking a principal part in the work, in addition to that at the Cape of Good Hope, were those at Bamberg, Leipzig, Göttingen, and, in America, Yale University. All these observatories are provided with the modern heliometer (q.v.), the most precise apparatus for measurement on the sky at present known to science. Gill's final result for the solar parallax, published in 1897, was $8.802''$, equivalent to a solar distance of 92,874,000 miles.

It may be of interest here to show the relative importance or "weight" of the various parallax methods. The general work of high authority on this topic is the *Fundamental Constants of Astronomy*, by Simon Newcomb (Washington, 1895). Newcomb assigned the following weights, or relative degrees of precision:

From the aberration constant.....	weight 68
From the planetoid method.....	weight 20
Six other methods combined.....	weight 35

Newcomb was already at that time in possession of the preliminary results of Gill's researches, communicated to him in advance of publication. But later several important series of aberration determinations were made public, and the results exhibited certain small discordances among themselves, which discredited somewhat the aberration method and consequently enhanced the relative weight of the planetoid method. The latter method gained also from the discovery in 1898 of the planetoid Eros (q.v.), which is much more favorably situated for parallax determinations than any previously known. Accordingly, an international campaign of observations on Eros was undertaken at its opposition in 1900-01, and the value of the solar parallax, as finally reduced by Hinks, was found to be $8.7968''$. Another and more favorable opportunity for the observation of this planetoid will occur in 1931, and a more thorough plan for international coöperation on that occasion has been initiated.

The final result for the solar parallax at present accepted by astronomers in general is $8.80''$, corresponding to a distance of 92,789,000 miles between the earth and the sun.

PARALLELEPIPED (ML. *parallelepipedum*, from Gk. *παράλληλεπῖπενον*, *parallēlepēdon*, from *παράλληλος*, *parallēlos*, parallel, from *παρά*, *para*, beside, beyond + *ἀλλήλων*, *allēlōn*, of each other, from *ἄλλος*, *allos*, other + *ἄλλος*, *allos*, other, + *ἐπίπενον*, *epēdon*, plane surface, from *ἐπί*, *epi*, upon + *πέδον*, *pedon*, ground), at one time commonly (United States) spelled **PARALLELOPIPED**. A solid figure having six parallelograms for faces. Therefore any two opposite faces are equal and parallel. If the faces are all squares the parallelepiped is a cube. The volume of a parallelepiped is found by multiplying its base by the altitude.

PARALLEL FORCES. See MECHANICS.

PARALLELISM. A term used in philosophy to denote a hypothetical relation of matter and consciousness. In the history of philosophy Spinoza is the most thoroughgoing parallelist, holding that matter and ideas are both attributes of one divine subject, and that every material object, or instance of the material attribute, has its ideal counterpart. In modern times the term "parallelism" is used more particularly in psychology and in epistemology to denote the specific parallelism of the human (or animal) body with the concrete consciousness of man (or lower animal). In this usage parallelism means the concomitance of brain process and mental process. It is distinguished from interactionism, which holds that mental processes may cause and precede brain processes and conversely. Psychologists, however, do not accept parallelism as an explanatory theory, but only as a hypothetical statement of a relation of body and mind which may be used as a basis for the formulation of psychophysical facts. The solution of the ultimate problem is by them held in abeyance or referred to the epistemologist. See **BODY AND MIND**; **DUALISM**; **KNOWLEDGE**, **THEORY OF**; **MIND-STUFF THEORY**; **OCCASIONALISM**.

PARALLEL KEY. See **KEY**.

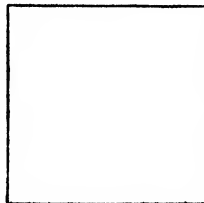
PARALLEL MOTION. See **MECHANICS**.

PARALLELOGRAM (Lat. *parallelogrammum*, from Gk. *παράλληλογράμμος*, *parallēlogrammos*, neut. sing. of *παράλληλόγραμμος*, *parallēlogrammos*, bounded by parallel lines, from *παράλληλος*, *parallēlos*, parallel + *γράμμα*, *gramma*, line, let-

ter, from *γράφειν*, *graphein*, to write). A quadrilateral whose opposite sides are parallel. From this it follows that the opposite sides must be equal and the opposite angles must also be equal. Therefore, if one angle of a parallelogram is a right angle, all of them are right angles, and the figure is then called a *rectangle*; and if at the same time all the sides are equal, the figure is a *square*. If the sides are equal, but the angles not equal, it is a *rhombus*. If only the opposite sides are equal, it is a *rhomboid*.

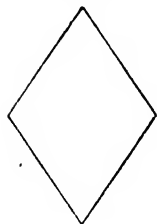


RECTANGLE.

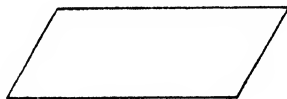


SQUARE.

The diagonals of a parallelogram bisect each other, each bisects the parallelogram, and the sum of their squares is equal to the sum of the squares of the sides of the parallelogram. All



RHOMBUS.



RHOMBOID

parallelograms which have equal bases and equal altitudes are equal in area, and this area is found by multiplying the base by the altitude.

PARALLELOGRAM OF FORCES. See MECHANICS.

PARALLELOPIPED. See PARALLELEPIPED.
PARALLELS (Fr. *parallèle*, from Lat *parallelus*, *parallelus*, parallel) In military fortifications, trenches cut in the ground, parallel to the position under siege, and designed to protect the men and guns of the besiegers from the fire of the besieged. See SIEGE AND SIEGE WORKS; FORTIFICATION.

PARALLELS, OF CIRCLES OF LATITUDE. Circles drawn round the surface of the earth parallel to the equator. They are the intersections with the earth's surface of planes which cut the earth at right angles to its axis. The greatest of these circles is the equator, which has the centre of the earth for its centre, the radius of the earth for its radius, and is equally distant at all points from each pole. It is evident that, of the others, those next the equator are greater than those more remote, and that they become less and less till at the poles they vanish altogether. The radius of any one circle is equal to the earth's radius multiplied by the cosine of the latitude, if we regard the earth as a sphere. The rotary velocity of the earth's surface, which is about $17\frac{1}{4}$ miles per minute at the equator, is therefore about $8\frac{1}{2}$ miles in lat. 60° and in lat. $89\frac{1}{2}^\circ$ (within 35 miles of the pole) is not more than 267 yards per minute. The most important parallels of latitude are the tropics of Cancer (lat. $23^\circ 28' N$) and

Capricorn (lat. $23^\circ 28' S.$), and the Arctic (lat. $66^\circ 32' N.$) and Antarctic circles (lat. $66^\circ 32' S.$). See LATITUDE AND LONGITUDE; MAP.

PARALLEL SAILING. See SAILINGS.

PARALYSIS (Lat., from Gk. *παράλυσις*, palsy, paralysis, from *παράλυν*, *paralyein*, to disable the side, from *παρά*, *para*, beside, beyond + *λύνειν*, *lycin*, to loose), sometimes called PALSY. Complete loss of the power of voluntary movement. A mere weakening or partial paralysis of the voluntary muscles is termed paresis. Since the muscles depend for their motor impulses on the nervous system, lesions of this part of the organism are responsible for paralysis in the majority of instances. It must be noted, however, that loss of motor function occasionally arises from disease of the muscle itself, as in certain dystrophies; or the will power may be at fault, as in hysteria.

Paralysis may be caused by lesions of the brain, of the spinal cord, of the nerve trunks or their terminations. It may be central or peripheral, according as its origin is in the central nervous system or in the nerve trunks or their endings. When a single member, such as an arm or leg, is affected, the term "monoplegia" is used. Simultaneous paralysis of both sides of the body is termed paraplegia. When the entire half of the body is paralyzed the condition is known as hemiplegia. Paralysis of all the extremities, with spasm, is denominated diplegia. Brain paralyzes are usually hemiplegic, and the paralysis is on the opposite side of the body from that of the lesion, except when the pons is involved. Then there occurs what is termed crossed paralysis, i.e., facial paralysis on one side and paralysis of the extremities on the other. Paralyzes originating in the spinal cord are apt to be paraplegic, i.e., affecting all parts below the level of the lesion. Peripheral paralyzes are limited to the area supplied by the nerve or nerves involved. Cerebral paralyzes are due in general to apoplexy (q.v.), injuries of the skull and dura, collections of fluid in the ventricles (as in hydrocephalus), abscess, and tumor. In the spinal cord injuries to the vertebrae, resulting in pressure, occasion paralysis below the point of injury; myelitis (q.v.) is a common cause, and infections such as infantile spinal paralysis (q.v.) and tumors may have the same effect. The peripheral nerves may be involved by the pressure of fractures, they may be severed by injury, and they may become inflamed as in neuritis. Peripheral paralyzes are peculiarly apt to arise from poisons such as alcohol, lead, tobacco, and mercury. A few specific diseases to which the term "paralysis" is applied may be briefly described.

Hemiplegia, popularly known as paralytic stroke or stroke of apoplexy, affects the entire half of the body, including the face and tongue. The affection is noticed under APOPLEXY. Facial paralysis (Bell's palsy) is due to injury or inflammation of the seventh nerve, although it may be central in origin. One side of the face is usually involved, but double facial paralysis is occasionally observed. Paralysis agitans is described under its proper title, as is also acute anterior poliomyelitis or infantile spinal paralysis. Bulbar paralysis occurs in an acute form, from hemorrhage into the medulla or pons or of thrombosis or embolism of the arteries supplying these centres; an asthenic form (Erb's disease, myasthenia gravis); and in a chronic

progressive form, due to degeneration of the nuclei of the eighth, ninth, tenth, eleventh, and twelfth cranial nerves in the medulla. The symptoms characteristic of bulbar paralysis are loss of control over the muscles of the lips, tongue, and pharynx, whence arises the difficulty of chewing, swallowing, breathing, and speaking experienced by those affected.

Acute ascending (Landry's) paralysis is a rare disease, marked by a loss of power first appearing in the feet and rapidly extending upward until the medulla is reached and death ensues. The cause is obscure, and the disease often terminates fatally within a week. Duchenne's paralysis is a chronic affection characterized by progressive muscular weakness with an apparent hypertrophy of the muscles. It is a disease of children under 10 years of age. The muscles of the calf are first attacked, but the remaining muscles of the body are soon involved, and the patient becomes absolutely helpless before death. The disease is a purely muscular one, consisting of an overgrowth of fibrous tissue at the expense of the muscle elements, with fatty deposition and degeneration. Pseudohypertrophic muscular paralysis is noticed under **MUSCLE DISEASES**.

General paralysis of the insane (paretic dementia) is an organic disease of the brain, characterized by inflammation of the meninges and cortex, with thickening of the former and wasting of the latter. The malady is most common in males between the ages of 30 and 60 and is brought on by overwork, intemperance, syphilis, or lead poisoning. In the beginning there is a period marked by mental disturbance, alienation, fine muscular twitchings, especially of the tongue and facial muscles; then follows a period of progressive mental failure and physical decay, and finally there is a complete breaking down of all the mental, motor, sensory, and nutritive functions.

Infantile cerebral paralysis may be hemiplegic, diplegic, or paraplegic. The paralysis is spastic, i.e., there is spasm and rigidity of the muscle in addition to the paralysis. The affection arises from diseases of the mother during pregnancy, accidents during delivery, or later it may be caused by specific infections such as meningitis, diphtheria, scarlet fever, etc., or by traumatism. The onset is marked by convulsions and coma, fever, delirium, and vomiting. As consciousness returns, paralysis is discovered, which may partially disappear. When the lower extremities are affected, as often happens, walking is nearly or quite impossible. Recently surgeons have been able to bring about great improvement in these cases by section of the posterior spinal nerve roots. Some of these children become epileptics and others are feeble-minded.

Spastic spinal paralysis (lateral sclerosis; spinal paralysis of the adult) is a disease of early adult life, of obscure causation, but assigned usually to syphilis, injuries, lead poisoning, or the acute infectious fevers. The symptoms are gradual loss of power, combined with rigidity of the muscles. Spasms attack the legs so that they are bent back rigidly to the pelvis. When walking the patient has a characteristic gait, the legs dragging and the toes catching against the ground. The disease is chronic, progressive, and incurable.

Hysterical paralyses may involve any muscle of the body and are too numerous to be men-

tioned here. (See **HYSTERIA**.) A specific form of spastic paralysis of the legs is observed in India and Tibet, as a consequence of eating flour made from *Lathyrus sativus*. The malady is known as lathyrism, lupinosis (q.v.), or chick-pea disease. See **FACIAL PARALYSIS**.

PARALYSIS AGITANS (Lat., shaking palsy), **PARKINSON'S DISEASE**, **SHAKING PALSY**. A chronic progressive nerve disease, in which the principal symptoms are tremor, muscular rigidity, restlessness, weakness, and altered sensations. It was first described by Parkinson (q.v.) in 1817. It occurs more frequently in males, and generally between the ages of 50 and 70. It is caused by exposure, hard labor, and great fatigue. Fright or injury may immediately precede an attack. The earlier symptoms are pains in one arm, with tremor of one hand, the fingers working together as if the patient were pulling or picking at something (pill rolling). Stiffness in the arm follows, and the process invades the leg of the same side. The neck becomes stiff and the body bent forward. The face is immobile, the voice high pitched and mumbling, the gait festinating, i.e., the steps become faster and faster until the patient has to stop to prevent falling forward. The disease lasts from 3 or 4 to 12 years. The pathological changes found consist of hypertrophy of the nerve cells of the pons, induration of the pons, medulla, and cord, thickening of the blood-vessel walls and of the pia, and increase of connective tissue in the motor tracts, nerves, and muscles. (Dana.)

The most successful treatment consists of rest, freedom from mental anxiety, outdoor air, warm baths, and massage. Among drugs, hyoscine, codeine, quinine, arsenic, cannabis, veratrum, salicin, nitrate of silver, conium, atropine, and phosphorus have been used to relieve various conditions and with varying results. Berkeley recommends parathyroid-gland extract, with which he has obtained a most favorable effect. Similar good effects have been derived from the use of pituitary extract. The mental condition, which may be hysterical or emotional, sometimes delusional, is improved by strong mental influences, routine and control, and employment. Consult Osler, *Modern Medicine* (New York, 1915).

PARALYSIS OF THE THROAT. See **HORSE, Diseases of the Mouth**.

PARAMARIBO, pār'a-mār'i-bō. The capital of Dutch Guiana, South America, situated on the left bank of the Surinam River, about 17 miles above its mouth, in lat. 5° 50' N. and long. 55° 10' W. (Map: Guiana, Dutch, G 2). Its climate is very hot, the average annual temperature being over 80° F. Paramaribo has the neat appearance of a Dutch town, with its wide streets shaded with trees and lined with brightly-colored modern houses. The government buildings are situated near the river, forming the so-called government plain. There are a number of churches and synagogues. The harbor is safe and commodious, and fortified by the two forts of Zeelandia and New Amsterdam. A number of wharves are situated along the river. Paramaribo receives the entire trade of Dutch Guiana and is the seat of a number of foreign consuls. Pop., 1902, 31,729; 1912, 34,898, or 40 per cent of the entire population of Dutch Guiana.

PARAMATTA, pār'a-māt'ā. A town of New South Wales. See **PARAMATTA**.

PAR'AMEN'THANOL. See MENTHOL.

PARAM'ETER (from Gk. *παρά, para*, beside, beyond + *μέτρον, metron*, measure). As commonly used in mathematics, any constant quantity, i.e., a quantity fixed in value, entering into an equation. In analytic geometry it is used either as a constant or as a variable. Thus, the line in a conic section called by the ancient geometers *latus erectum*, by later writers *latus rectum*, and now known as the parameter, is a constant for any given curve, but a variable quantity for a family of curves of that type. For example, in the equation of a parabola (q.v.) $y^2 = 2px$, where p is the parameter, p remains constant, while x and y vary so as to generate the curve. But if p be given a new value, while x and y pass again through the same cycle of values, a new parabola will be formed; and by repeating the process any number of curves may be generated which are said to belong to the same family. The method of variation of parameters is an important one in the treatment of differential equations. The name "parameter" is due to Mydorge (1585-1647).

PARAMORPHINE, pǎr'á-môr'fín or -fén. See ALKALOIDS.

PARAMUSHIR, pǎr'á-mōō-shēr', or **PARAMUSHIRI**. The largest of the Kurile Islands (q.v.).

PARANÁ, pii'rá-ná'. The largest river of South America after the Amazon, and one of the great rivers of the world. It is formed by the confluence of the Paranahyba and the Rio Grande in south Brazil at the common boundary point of the states of Matto Grosso, Minas Geraes, and São Paulo (Map: Brazil, G 8). The Paranahyba rises on the Serra dos Ventos and flows southwestward on the boundary between Minas Geraes and Goyaz. The Rio Grande, which is the longer of the head streams and may be regarded as the true upper course of the Paraná, rises on the Serra da Mantiqueira in the Coast Range, 60 miles from the Atlantic Ocean near Rio de Janeiro. It flows northwest and westward to the confluence, whence the Paraná proper takes a southwest course through Brazil, then south on the boundary between Brazil and Paraguay, whence it curves westward between Paraguay and Argentina until it receives its largest tributary, the Paraguay River (q.v.). From this point the lower Paraná flows southwest through Argentina as far as Rosario, where it finally turns to the southeast and enters the Atlantic Ocean through the Plata estuary, at the head of which it is joined by the Uruguay River (q.v.). The total length of the Paraná River from the ocean to the source of the Rio Grande is 2950 miles, and excluding the Plata 2720 miles. The length of the lower Paraná from the Paraguay confluence is 850 miles, and with the Plata 1080 miles. The Paraná is thus longer than the Mississippi proper, and the drainage area of the system is nearly equal to that of the Mississippi.

In its upper course the Paraná flows over the great Brazilian plateau, and most of its upper tributaries, including the two head streams, are obstructed by falls and rapids as they descend over the successive escarpments of the higher plateaus. The main river itself has the Falls of Urupunga a short distance below the confluence of the head streams. Below this point, however, it is navigable for 600 miles over the level surface of the plateau as far as the bound-

ary of Paraguay. Here it descends over the final great escarpment in the Falls of Guayra, in which the river plunges through numerous rocky clefts with a total fall of 70 feet. From this point to within 150 miles of the Paraguay confluence the stream rushes through a deep gorge over a series of rocky shallows and rapids. Here the banks are heavily forested, and most of the tributaries fall into the river by cata-racts, of which the Victoria Falls of the Iguazú (q.v.) rival Niagara in height and grandeur. Below the gorge and the Paraguay confluence the river flows unobstructed through the Pampas plains, and for the last 1000 miles of its course, including the Plata, is navigable at all seasons by large vessels, while transatlantic steamers go directly to Rosario, 400 miles from the ocean. It is 3000 yards wide at Corrientes, near the Paraguay confluence, and 7000 yards wide at Diamante. It reaches its greatest volume at Corrientes, and loses considerably by evaporation in its lower course, since it here receives scarcely any permanent tributaries except the Salado (q.v.). Several hundred miles above the estuary it begins to divide into parallel channels, inclosing a long island, and has a total width of 25 to 30 miles, while some of the channels are 2 miles wide. The delta proper begins 100 miles from the estuary, and consists of a vast network of channels and backwaters, emptying by 14 mouths into the Plata estuary. The main channel is accessible to the largest vessels even at low water, but all the channels are constantly and rapidly shifting, calling for great caution in their navigation. For the description of the river below the delta, see PLATA, Río DE LA. The Paraná was first ascended as far as the Paraguay confluence in 1526 by Sebastian Cabot. Consult: Manuel Bernárdez, *De Buenos Aires al Iguazú* (2d ed., Buenos Aires, 1901); E. L. Corthell, *Two Years in Argentina* (San Francisco, 1903); W. S. Barclay, "The River Paraná: An Economic Survey," in *Geographical Journal*, vol. xxxiii (London, 1909).

PARANÁ. A state of southeast Brazil, bounded by the Atlantic Ocean on the east, the State of São Paulo on the north, Paraguay and Matto Grosso on the west, and Argentina and Santa Catharina on the south (Map: Brazil, G 8). Area 67,570 square miles. The low strip of coast land is followed by a mountain range reaching an altitude of nearly 5000 feet and passing into an elevated plateau lying about 3000 feet above the sea. The portion along the west frontier slopes towards the Paraná River, whose tributaries are the chief rivers of the state. Most of them, however, are unfit for navigation, owing to rapids. The climate is generally healthful in the elevated portions, but very hot and humid on the coast and in the valley of the Paraná. Forests cover a large part of the state, especially in the western half, which is almost unknown and is inhabited by roving Indians. The soil is very fertile. The chief product and export is yerba maté. Cotton, rice, coffee, and manioc are cultivated on the coast, and grains and fruit in the more elevated regions. Lumbering also is carried on to some extent. Much attention has been given to immigration and there are numerous Polish and German colonies in the state. Pop., 1900, 327,136; 1913 (est.), 480,404. Capital, Curitiba (q.v.). Consult Lange, *Südbrasilien* (2d ed., Berlin, 1885).

PARANÁ (formerly *Bajada del Paraná*). The capital of the Province of Entre Ríos, Argentina, situated on a high bluff on the Paraná River, 370 miles from its mouth and opposite the city of Santa Fé (Map: Argentina, H 4). It is a well-built town with straight streets, good public buildings, a normal school, and a national college. It has an important inter-provincial trade, has daily steamship connection with Santa Fé, and is a station for all steamers ascending the Paraná River. Pop. (est.), 40,000. From 1853 to 1861 Paraná was the capital of the Argentine Republic.

PARANAGUÁ, pã'rã-nã-gwã'. The chief seaport of the State of Paraná, Brazil, situated on the Bay of Paranaguá, 400 miles southwest of Rio de Janeiro (Map: Paraguay, K 3). A regular steamship line connects the port directly with Hamburg, and woods, maté, sugar, and cereals are exported. Pop. (est.), 10,000.

PARANAHYBA, pã'rã-nã-ẽbã. One of the head streams of the Paraná (q.v.).

PARANOIA (Neo-Lat., from Gk. *παράνοια*, madness, from *παρὰ*, *para*, beside, beyond + *νοεῖν*, *noein*, to think). An incurable form of insanity in which for many years the intellect of the patient remains unimpaired, though dominated by a systematized delusion. It is a chronic progressive psychosis occurring mostly in early adult life, characterized by the gradual development of a stable progressive system of delusions, without marked mental deterioration or clouding of consciousness, but with such disorder of thought and conduct as is conditioned by the delusions. There is almost invariably present an acquired or transmitted neurodegenerative taint, though an attack may be precipitated by a sudden or severe injury to the nervous system. It may follow an injury to the head.

Paranoics rarely present somatic evidences of degeneration, such as a deformed or asymmetrical skull, badly developed teeth, strabismus, atrophy of one side of the body, and differences in size of hands or feet. In several cases examined by Spitzka anomalies of the cerebrum were found.

Mild forms of paranoic condition are presented by persons who exhibit perverse acts, morbid ideas, persistence in absurd notions, and who are commonly called cranks. These persons become imbued with an idea, are dominated by it, and talk constantly of it. They are suspicious, consider themselves slighted or the subject of remark. They think they are neglected or martyred, fancy there is a combination against them, and are frequently melancholic. These patients are able to carry on a business or practice a profession. They are considered to be *formes frustes* of paranoia. Paranoid trends of thought occur in constitutional mental inferiors, whose minds become permanently dominated by delusional beliefs and the impulses springing from them. There is a paranoid form of dementia præcox in which persecutory ideas and belief in conspiracy occur, but dementia is the prominent symptom.

True paranoia is the ordinary type of chronic delusional lunatic who was eccentric in childhood and hypochondriac in his youth, and is excessively egotistical, whose failures are considered to be due to conspiracy, who betrays delusions of persecution and hallucinations of sight and hearing. The usual delusion of per-

secution may be replaced by systematized delusions of erotic, religious, or patriotic nature. As soon as the fixed idea appears, as a result of some delusional interpretation, the disease develops rapidly and is characterized by the unchangeability of the basic fixed idea, the faith of the patient in his delusions, the apparent logic of the delusional system, the promptness and intensity of his reactions, the existence of false interpretations (often including transferred personality), and the absence of intellectual enfeeblement. Paranoics have no insight into their condition. They often, under prolonged coaching, are able to conceal their delusions for years. The paranoic is usually homicidal, either because of mandatory hallucinations or of persecutory delusions. Early moral control may do much for mild cases, even aborting the psychosis. The regularity of life in asylums, with their discipline, recreations, and employment, is often beneficial.

The disease is more frequent than is supposed by those who have had no experience with criminals. The careful statistics of Matteawan State Hospital for the Criminal Insane in New York State showed over 30 per cent of paranoics in 1911. Consult: Richard von Krafft-Ebing, *Treat-Book of Insanity* (Philadelphia, 1905), A. R. Diefendorf, *Clinical Psychiatry*, adapted from Emil Kraepelin, *Lehrbuch der Psychiatrie* (2d ed., New York, 1907), Clark and Diefendorf, *Neurological Mental Diagnosis* (ib., 1908), Joseph Rogues de Fursac, *Manual of Psychiatry*, translated and edited by A. J. Rosanoff (3d Amer. ed., ib., 1911).

PAR'APET. See FORTIFICATION.

PAR'APH (OF, Fr *paraph*, *paragraphe*, It. *parafo*, *paragrafo*, from ML *paragaphus*, from Gk. *παράγραφος*, marginal line, from *παράγραφεῖν*, *paragraphein*, to write beside, from *παρά*, *para*, beside, beyond + *γράφειν*, *graphein*, to write). An addition to the signature formed by a flourish of the pen, which during the Middle Ages constituted some sort of provision against a forgery. Its use is not altogether extinct in diplomacy, and in Spain the paraph is still a usual part of a signature.

PAR'APHERNALIA (ML nom. pl., from Lat *parapherna*, from Gk. *παράφερνα*, property of a bride above her dower, from *παρά*, *para*, beside, beyond + *φέρν*, *phernē*, dower, from *φέρειν*, *pherein*, to bear). Articles of wearing apparel and ornament suitable to a wife's station in life, which were given to or acquired by her either before or during marriage. Both the Roman and the later civil law recognized a special property in the wife, as to her necessary articles of clothing and ornament, and the name and idea were adopted from those systems into the English law. By the common law all of a wife's personal property belonged absolutely to the husband and he could dispose of them at his discretion, and her paraphernalia were no exception to the rule, but on his death the wife could hold the paraphernalia against the personal representatives and legatees, though not as against creditors. The husband could not dispose of her paraphernalia by will.

No exact list of articles which may be included under the term "paraphernalia" can be given, as the rules vary in different jurisdictions. In general it may be said that to be classed as such the clothing and ornaments must be such as would ordinarily be possessed by a woman in her station in life, and that

jewels, etc., given by the husband in excess of his means will not be included, but will pass at his death to his personal representatives. See HUSBAND AND WIFE, and consult references there given; also SEPARATE ESTATE.

PAR'APHRASE (Lat. *paraphrasis*, from Gk. *παράφρασις*, from *παράφραζειν*, *paraphrasein*, to repeat a statement in different words, from *παρά*, *para*, beside, beyond + *φράζειν*, *phrazein*, to say). In music, a free arrangement of a composition for some other instrument or instruments. Bülow's arrangement of *Tristan und Isolde* is merely a transcription, because he puts nothing into the piano score that Wagner has not written in the orchestral score. Liszt's arrangement of the Love Death is a paraphrase, because he uses rhythmic figures of his own invention. Also he begins with the motive of the Curse, which in Wagner's score does not precede the opening of the Death song. Liszt's transcriptions of the songs of Schubert, Schumann, and others are excellent examples of paraphrases. In literature, paraphrase is a restatement of a work, as a clearer rendering or free translation, or change from verse to prose.

PARAPHYSES, pār-ăf'i-sēz (from Gk. *παράφυσις*, *paraphysis*, offshoot, from *παράφειν*, *paraphyein*, to produce offshoots, from *παρά*, *para*, beside + *φύειν*, *phyein*, to grow). Outgrowths, usually filamentous in form, which are associated with reproductive organs, either sexual or asexual. Among the fungi paraphyses occur in connection with the spore-bearing organs in the formation of hymenial layers, as in *Asco-bolus*, black knot (*Spharia morbosa*), etc. The best-known use of the term, however, is in connection with the mosses, in which the groups of sex organs, especially antheridia, are often intermingled with hairlike paraphyses. See MUSCI.

PAR'APLE/GIA. See PARALYSIS.

PARAROSANILINE, pār-ă-rô-zăn'i-lîn. See COAL-TAR COLORS

PAR'ASANG (Lat. *parasangu*, from Gk. *παράσαγγος*, *parasanygēs*, from Pers. *farsang*, *parasang*). A lincal measure still used by the Persians and often alluded to by the Greeks. The estimate of its length given by Herodotus, Suidas, Hesychius, and Xenophon, and concurred in by modern travelers, is equivalent to about 30 Greek stadia, or 3½ English miles. Byzantine writers reckoned it 21 stadia; Strabo reckoned it at 30, 40, and even 60 stadia. Persian authorities are divided.

PARĀŚARA, pā-rī'shā-rā. A Hindu sage, reputed to be the author of some of the hymns of the Rig-Veda, where he is once mentioned (vii, 18, 21) as a friend of Indra. He is said to have been the son of Vasishtha, or, according to the more usual account, of Vasishtha's son, Sakti. The story runs that King Kalmashapada once met Sakti in a narrow path in a thicket and ordered him out of the way. The sage refused, whereat the King lashed him with his whip, and Sakti cursed him to become a rakshasa, or demon. In this transformation Kalmashapada killed and ate Sakti, together with the other sons of Vasishtha. Sakti, however, had left his wife, Adrishyanti, pregnant, and she gave birth to Parāśara, who was brought up by his grandfather. When he grew up and was informed how his father died he instituted a sacrifice for the destruction of all the rakshasas, but was dissuaded from its completion by Vasishtha and other sages. This legend is later expanded so that, as a reward for his for-

bearance, Parāśara is said to have been the compiler of the *Viṣṇu-purāṇa*. (See PURĀNA.) There is also attributed to him a law code, the *Parāśara-smṛti*, and a subpurana, the *Parāśara-purāṇa*, which, like some late works ascribed to Parāśara, may have been composed by historical personages bearing this name. The legendary Parāśara is said to have been the father of Vyasa (q.v.) by an intrigue with the Princess Satyawati.

PAR'ASELE'NÆ. See HALO.

PAR'ASITE (Lat. *parasitus*, from Gk. *παράσιτος*, one who eats at another's table, guest, parasite, from *παρά*, *para*, beside, beyond + *σιτος*, *sitos*, food), ANIMAL. Animals that feed on the fluids of other living animals that the latter have elaborated for their own use; also on the juices and even solid matters that they get while feeding in the interior of living plants. It is essential to the idea of parasitism that an injury is done to some other living organism within which, or fastened on to which, the parasite lives; and the organism that supports the parasite is called the host. Modes of life which are frequently confused with parasitism are symbiosis, a living together with marked mutual benefit, and commensalism, an association without particular advantage or injury to either party. The lines of distinction are, of course, rather vague and in the history of organic life one condition has doubtless been changed to another.

Parasites are either temporary or stationary. Temporary parasites are those that seek their host only occasionally or for a short time; they may have different individuals as hosts at different times, as in the case with the leech and bedbug. Stationary parasites are those whose parasitic life continues for a long time, perhaps as long as life, although not necessarily on the same host, e.g., the tapeworm, which during part of its life is a parasite of man and during another part of cattle. This regular alternation of hosts is rather common among the internal parasites, especially those of higher animals. Parasites may also be classified as ectoparasitic or endoparasitic. Ectoparasites live chiefly on the skin and are either temporary, as in the case of the mosquito, or stationary, as in the case of the itch mite. Endoparasites live chiefly in the alimentary tract or some other intestinal organ and are stationary.

Origin of Parasitic Life. A knowledge of this subject can best be gained by a study of certain groups where all gradations occur from free-living to parasitic forms. The first example may be taken from the group Copepoda. Many of these small crustacea swim free in the sea and in ponds. They feed on all sorts of organic débris. One genus, *Argulus*, travels about on the surface of the bodies of fish and feeds on their slime. Another genus, *Caligus*, has taken a further step; it has migrated under the gill cover of a fish and has attached itself to the gills, receiving food from the blood flowing through them. It is doubtless harmful; it is a true external parasite. Finally, other Copepoda, e.g., *Lernæonema*, have penetrated between the scales and are found embedded deep in the muscles of menhaden and other marine fishes, living entirely on the juices elaborated by them and typifying a complete internal parasite. We see in this case how living on waste organic matter passes by easy gradations to life on and in living organisms.

The nematode worms are chiefly parasitic.

TABLE OF PRINCIPAL PARASITIC ANIMALS

GROUP	Species	Host	Remarks
PROTOZOA			
<i>Rhizopoda</i>	Some Amœbæ are parasitic.	Alimentary tract of man, mammals, insects	Behavior in the body like pathogenic bacteria. Example: malaria.
<i>Sporozoa</i> . . .	All are parasitic.		
<i>Infusoria</i> . . .	Numerous parasitic forms, e.g. Balantidium coli. Trichodinæ. Opalina. Holophyra multihilis Acanthamoeba. Anoplophrya.	Colon of man On gills and gill cavity of frog. Bladder and gut of frog Surface of fish. Mantle cavity of mussels Intestine of various marine invertebrates.	
PORIFERA . . (Sponges)	No true parasites		Cliona bores in shells of lamellibranchs.
CeLENTERATA .	A very few species. Polypodium hydriforme parasitic at one stage Cunina, a medusa Edwardsia, an actinian Pennatodiscus socialis. Gastrea, a ctenophore	Immature ova of sturgeon (Ussow). In other medusa. In Ctenophora On Rhizostoma (Monticelli, 1898). In Salpa.	
SCOLECIDA			
<i>Turbellaria</i> . .	A few Rhabdocœla Graffilla muricicola Fecampia erythrocephala All parasitic, two cases: 1. Only one host, young like adult, ectoparasites 2 Two hosts, endoparasites.	In kidney of the gastropod Murex. In gut of crab (Carcinus mænas).	Called monogenetic. Called digenetic.
<i>Trematoda</i> (Liver flukes)		On or in gut and bladder of aquatic animals. The asexual generation in Mollusca, the sexual, usually in gut of some vertebrate	
<i>Cestoda</i> (Tapeworms)	All parasitic, with or without alternation of generation.	Adults in various vertebrates, young stages also in invertebrates.	Two hosts required for complete development.
<i>Nematoda</i> . (Roundworms)	Mostly parasitic	Plants and animals, chiefly vertebrates.	Complicated life history, frequently with alternation of generations.
<i>Acanthocephala</i>	Four genera, all parasites.	Rarely in man; the young live chiefly in arthropods, the adults in vertebrates, especially fish intestines	
<i>Nemertinea</i> <i>Rotifera</i>	Rarely parasitic Malacobdella. Various species, order Ploima Order Sisonacea	In lamellibranchs. On or in fresh-water Oligochaeta. On the crustacean Nebalia	Marine, form much modified.
POLYZOA . .	None parasitic.		
MOLLUSCA . .			
<i>Gastropoda</i>	Eulima, Stylifer, Thyca Entoconcha mirabilis } Entocholax, Entovalva. } Sistrum.	Holothuria, starfishes, echinoids. Inside of Synaptidæ (Holothuroidea).	Embedded in skin, often forming tumors. Attached to blood vessels or muscles.
ECHINODERMATA	No parasitic species.	Certain corals	
ANNELIDA			
<i>Chaetopoda</i> (Sandworms)	Labrorostratus and Hæmato- cleptes (Eunioideæ). Some species of Polynoe } Species of Mysostomidæ } Most species are ectoparasites	In the body cavity of other chaetopods. In other invertebrates, as erinoids, on which galls are formed Mollusca, vertebrates	Temporary parasites, some leeches are carnivorous.
<i>Hirudinea</i> . . . (Leeches)			
CRUSTACEA .	Many Copepoda, e.g. Argulus Caligus. Lernaonema Some Cirripedia, especially Sacculina A few Amphipoda, e.g.: Cyamus. Hyperia. Many Isopoda, e.g. Anceus. Bopyridæ Cymothoidæ	Surface of fishes. On gills of fishes. In flesh of fishes Crabs, beneath abdomen. Skin of whales In the jelly of large medusa. On the fish Cottus On the gills of Crustacea. On fishes	Reduced to mere sacs.
INSECTA . . . (Insects)	Many plant parasites Certain groups of animal parasites, e.g. Mallophaga (bird-lice). } Pediculidæ (lice). } Membranacei (bedbugs). Strepsiptera. Aphaniptera (fleas) Pupipara (sheep lice) Culicidæ (mosquitoes) and many other Diptera Ichneumon flies.	Birds and mammals Warm-blooded vertebrates Hymenoptera and other insects Birds and mammals Birds, mammals, and bees Warm-blooded vertebrates Immature stages of other insects.	Ectoparasites, on feathers and hairs Temporary ectoparasites. Ectoparasites. Stationary ectoparasites. Ectoparasites. Active in the larval stage.
ARACHNIDA (Spiders, etc.)	Many parasites among Acarina (mites); Ixodoidea, ticks, Hydrachnoidea, water mites; Gamasoidea, includes poultry mite; Sarcopitoidea, itch and mange mites; and others.	Chiefly vertebrates, but also insects and other invertebrates.	A greatly modified arthropod.
VERTEBRATA .	Myxiniidæ (hagfishes).	Bore into the body cavity of fishes	

Some of the Anguillulidæ, or vinegar eels, however, live in organic fluids. The Ascaridæ, or stomach worms, live for the most part in the organic fluid contents of the intestine, which they still have to digest somewhat, so that they are on the line between messmates (see COMMENSALISM) and true parasites. They are, however, in great danger of being indubitable parasites, and this is the fate that befalls some of their kindred, e.g., *Trichina spiralis*. (See TRICHINA.) *Anguillula*, *Ascaris*, and *Trachina* show how parasitism has arisen in a group that originally had come to live on organic fluids, and especially how those animals that live on the surface of other animals, devouring their excretions (or waste fluids), will easily come to penetrate the flesh, devouring the vital secretions (or functional fluids). They will pass from scavengers to parasites.

The question why animals which are in a position to become parasites often do become parasites is not difficult to answer. Parasitic life brings great advantages to the parasite. First, it affords an abundant food supply; second, it diminishes the chance of direct attack from other organisms. The great disadvantage of abject parasitism is this, that the parasite is restricted in its environment, and, since the body that it inhabits is mortal, it must make special provision for the continuation of the species. In mammals the capacity of infecting the embryo while attached to the mother would be of great service in insuring this continuity, and a certain threadworm of the dog (*Flava immitis*) has been found to be transmissible from parent to fetus, as seems to occur in few species. Most parasites depend either upon the flesh of the host being eaten by a second host, or else the young are discharged, encapsuled (to protect them from desiccation or other untoward conditions), and take their chances of being picked up by a suitable host. To increase the chances of the continuity of life from one individual to the next, the fertility of parasites has become extraordinary. Indeed, in the group of copepods, where the embryos are carried in external pouches, one may see how the embryo pouches become larger as the parasitism becomes more complete. Van Beneden states that a single nematode produces 60,000,000 ova. The rich food supply of the parent makes this great fertility possible. In extreme cases the parasite is little more than an egg sac. To increase the fertility still more, fission, in the case of cestodes at least, has been added.

The adaptations in structures of parasites are striking. First, temporary parasites must move over the body of their hosts or go from one host to another. Hence (1) sense organs are developed to direct them in their migrations, and they are provided with locomotor apparatus, e.g., the springing legs of the flea; (2) stationary parasites gain apparatus for holding on, as suckers in cestodes and nematodes, and hooks in mites and copepods. Certain cestodes have both suckers and hooks; in still other cases, as in the degenerate cirriped *Saculina*, roots or holdfasts are developed, which also serve as imbibitory tubes; (3) endoparasites lose their locomotor organs, for large legs would be a disadvantage to burrowing parasites, such as *Demodex*, among mites, or unnecessary, as in the copepod *Caligus*; (4) endoparasites lose also their sense organs, because no longer useful, as is the case in parasitic Copepoda; (5) the alimentary tract

becomes degenerate in extreme forms, because food is gained by osmosis through the body wall (e.g., cestodes). In less extreme cases the alimentary tract is simplified on account of the absence of necessity for digestive apparatus.

Economic Considerations. The number of animal parasites harbored by one host may be enormous. Thus, in a young horse Krause found 500 *Ascaris*, 190 *Oxyuris*, several millions of *Strongylus*, 214 *Sclerostomum*, 287 *Filaria*, 69 adult and 9 immature *Tænia*. The destruction wrought by these parasites is sometimes very great. It is estimated that half a million pullets die yearly in England from gapes, caused by a threadworm (*Syngamus trachealis*). England in 1880 was estimated to be losing about 1,000,000 sheep annually from liver flukes. Fortunately the United States has been visited by no such scourges, but scores of cattle regularly die of the liver fluke in this country. The United States Bureau of Animal Industry makes official investigations into epidemics of parasites among the higher animals.

Although certain parasites are very injurious to man and his living possessions, others are among man's best friends. The common and injurious tussock moth (*Hemerocampa leucostigma*) is the prey of more than 20 different kinds of insects, chiefly Hymenoptera and Diptera, whose larvæ live in the immature tussock moth. Frequently as many as 90 per cent of the pest's larvæ and pupæ die as a result of these enemies. The complicated nature of parasitism is illustrated by the fact that these parasites also have parasites, called hyperparasites, enemies of man because they lessen the effectiveness of the primary parasites. However, a new set of parasitic friends come in, the tertiary parasites, which prey upon the hyperparasites. The matter seems to end there and does not go on "ad infinitum," as the familiar rhyme about the fleas states.

Artificial methods of controlling brown-tail and gypsy moths (see GYPSY MOTHS) in New England failed, and the government has introduced from Europe parasites of these moths with fair prospects of success. The ladybird beetles, although predacious rather than parasitic, confine their attentions largely to scale insects and plant lice. The citrus industry of California was saved from destruction by the Australian cottony cushion scale (*Icerya purchasi*) through the introduction of an Australian ladybird beetle, *Vedalia cardinalis*. Practically all the important insect pests of the United States are insects which have been introduced from foreign lands. They have become pests because their parasites have not been introduced also. Many of the native insects are potentially very injurious, but they are kept in check by their parasites.

Consult: P. J. Van Beneden, *Animal Parasites and Messmates* in "International Scientific Series," vol. xix (New York, 1889); M. G. C. C. Braun, *Animal Parasites of Man* (3d ed., trans. by Pauline Falcke, New York, 1908); id., *Handbook of Practical Parasitology*, translated by Linda-Forster (ib., 1910); W. B. Herms, *Laboratory Guide to the Study of Parasitology* (ib., 1913); H. B. Fantham, *Some Minute Animal Parasites* (London, 1914). See EVOLUTION, Parasitism.

PARASITE, PLANT. The plant kingdom presents abundant illustrations of parasitism, from bacteria to such flowering plants as the mistletoe and dodder. A member of the im-

PARASITIC FLOWERING PLANTS



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- 1 BROOM-RAPE - APHYLLON UNIFLORUM
- 2 CANCER-ROOT - CONOPHOSUS AMERICANA
- 3 DODDER - CUSCUTA GRONOVII

- 4 MISTLETOE - PHORADENDRON FLAYESCENS
- 5 CLOVER BROOM-RAPE - OROBANCHE MINOR
- 6 BEECH-DROPS - EPIFAGUS AMERICANUS

mense group of fungi must always be either a saprophyte (q.v.) or a parasite, and some entire groups have adopted the latter habit, the most disastrous of the plant diseases being due to fungus parasites. The potato rot and grape downy mildew are caused by members of the Peronosporales. (See PHYCOMYCETES.)

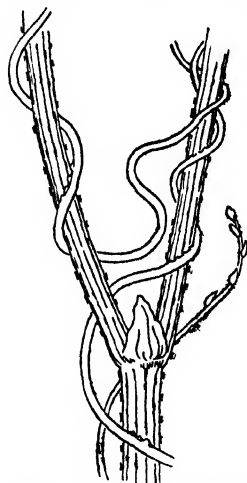


FIG 1 DODDER (*Cuscuta*) PARASITIC ON A HOP STEM

The structures developed by many of these parasites to adjust themselves to their hosts are remarkable and lead to some very complex life histories. A life of parasitism appears to result in sexual degeneration (see FUNGI), so that, associated with remarkable specialization of vegetative organs, there is apparently in a number of groups the entire loss of sexuality. There are also some remarkable parasites among the flowering plants, the dodder (Fig 1) being an extreme example of complete dependence upon its host, the root disappearing, the leaves being mere scales, and the flowers much reduced. Other plants have well-developed green leaves and yet always grow with their roots or other parts connected with some host which supplies certain of their wants. Among these may be mentioned the mistletoe (*Viscum*), *Euphrasia*, and *Pedicularis*, the first named probably depending upon its host for almost all the water that comes to it. Parasites establish relations with their hosts generally by sucker-like structures, called haustoria (q.v.), which in many of the fungi are special branches which pierce the cell walls (Fig. 2). See also SYMBIOSIS.

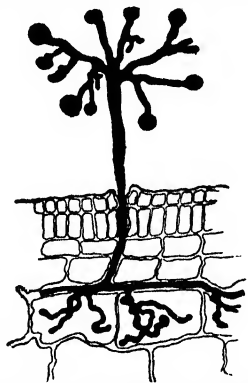


FIG 2 DIAGRAM OF FUNGUS PARASITIC IN THE TISSUE OF THE HOST PLANT AND FORMING SPORES ABOVE THE SURFACE

PARASITIC DISEASES. An important subdivision in the classification of disease (See NOSOLOGY) In these diseases certain morbid conditions are induced by the presence and vital activities of various low forms of animal or vegetable life which have found lodgment and subsistence in some tissue or organ or upon some surface of the body of man or animals. Even plants are not exempt from disorders of this nature. See PARASITE, PLANT

The vegetable microorganisms which cause disease are far more numerous and important than the animal. They may be divided into three classes: (1) the *Blastomycetes*, or yeast fungi; (2) the *Hyphomycetes*, or molds; and (3) the *Schizomycetes*, or bacteria.

1. The yeasts are important principally as causes of fermentation. One member of the family, however, is pathogenic, and produces swellings which break down into abscesses in man and horses. It is called blastomycosis (q.v.). Closely allied to this is thrush (q.v.), a variety of stomatitis caused by the *Oidium albicans*. By some writers thrush is classed among the affections due to molds. Yeasts are common in the stomach, being introduced with the food, and are found in diabetic urine.

2. The pathogenic molds are found upon the surface of the body, since they require free oxygen for their growth. They are responsible for many skin diseases. Favus (q.v.) is caused by the *Anchorion schenleum*. Pityriasis versicolor, also called chloasma, is caused by the *Microsporon furfur*. Actinomycosis (q.v.) is due to infection by the ray fungus (*Actinomyces*). Madura foot is a serious disease occurring in the feet of natives of India, was described in 1874 by Carter, and is due to the *Streptothrix mycetoma*. Erythrasma is caused by the *Microsporon minutissimum*. Ootomycosis and pharyngomycosis are due to the *Aspergillus fungus*, an organism which also penetrates the lungs. The *Leptothrix buccalis* is found on the inner side of the cheeks and is believed to induce caries. Nocardiosis is a name applied to a class of infections characterized by the presence of certain branched organisms, some of them resembling molds. The lesions are mostly found in the respiratory tract and are of interest from the fact that they may be easily mistaken for those of tuberculosis.

3. The Schizomycetes, or bacteria, are by far the most important and interesting of the vegetable parasites. They penetrate every tissue of the body and are known to be the cause of most of the specific febrile diseases and are suspected to be the cause of others. The study of these organisms has almost reached the dignity of a separate science. See BACTERIA.

Animal Parasites. These may be classified as insects, worms, and protozoa. The rôle played in the causation of the disease by insects is discussed under INSECTS, PROPAGATION OF DISEASE BY. Among the true parasitic insects are fleas, lice, and ticks. Jumping fleas, *Pulex*, are of interest as the carriers of bubonic plague; they also act as an intermediate host for certain tapeworms, and their larvæ may become pseudo parasites in man. The burrowing flea (jigger, chigger, or chigoe), *Sarcophylla penetrans*, penetrates the skin and causes painful pustules. Lice are not only parasites, but they often transmit several diseases, among which the most important is typhus fever. Myiasis (q.v.) consists in an infection from the larva of flies. Of these the grub of the screw worm, *Comptosia macellaria*, deposits its eggs in open wounds or in the nostrils. Flesh-fly larvæ, *Sarcophaga*, are found in wounds, in the ear canals, in the intestine and anus. A number of other fly larvæ are described as attacking man. They all produce serious and often fatal symptoms.

Worms form a large and important class of animal parasites, but only a few can be mentioned here. The trematodes or flukes, infection

by which is termed distomatosis, inhabit the lungs, liver, intestine, and veins. These infections are most plentiful in the tropics, but are found in all parts of the world. Bilharziosis is one of the most common forms and consists in invasion of the veins by the parasite *Schistosomum hæmatolum*, described by Bilharz in 1852. There is also an Asiatic blood fluke, *Schistosomum japonicum*, discovered by Katsurada in 1904 (See BILHARZIA DISEASE). Of the intestinal parasites teniasis, or tapeworm infection, occurs in many forms, over 300 species are described. In their larval stage they are the cause of hydatid (q.v.) disease and cysticercosis. Roundworm infections include hookworm disease (q.v.)—the common large intestinal roundworm, *Acaris lumbricoides*, and the pinworm, *Oxyuris vermicularis*. The most important muscle roundworm is the *Trichinella spiralis*, which obtains entrance into the body through the eating of raw or rare pork. The disease is called trichinosis or trichiniasis (q.v.). Filariasis is due to a threadlike worm, *Filaria sanguinis hominis*, or, more exactly, *Filaria bancrofti*. Elephantiasis (q.v.) is caused when the parasite invades the lymph channels and obstructs their flow. *Filaria loa* is the cause of an interesting disease called Calabar swelling.

Arthropods include the *Icarus*, to which species belong the itch mite, *Acarus scabiei* (see SCABIES), and the comedo mite, *Demodex folliculorum*, both of which are described under their proper titles. the harvest mite, *Leptus americanus*, also known as the red bug, or harvest bug, attacks man, generally in the harvest season, and burrows under the skin. Tongue-worm infection, and a number of other forms of acariasis, are very rare.

Protozoa are unicellular organisms, of which thousands of species have been named and described by zoologists. They are divided into four great classes, viz., sarcodina, mastigophora, infusoria, and sporozoa, the latter are always parasitic and cause a number of diseases in man, among which are malaria (q.v.), blackwater fever, and sleeping sickness (q.v.). The last is a form of trypanosomiasis. Trypanosomes are described as sinuous, wormlike organisms, consisting of a single cell and terminating in a long flagellum. Finally, we may mention the *Amæba*, to which a form of dysentery (q.v.) is due, and *Spirochæta pallida*, or *Treponema pallidum*, the specific organism of syphilis (q.v.).

Consult Millard Langfeld, *Introduction to Infectious and Parasitic Diseases* (Philadelphia, 1907); L. G. Neumann, *Treatise on the Parasites and Parasitic Diseases of the Domesticated Animals*, translated by Fleming (new ed., New York, 1910); P. E. Archard, *Microscopy, Bacteriology, and Human Parasitology* (2d ed., Philadelphia, 1912); B. F. Kaupp, *Animal Parasites and Parasitic Diseases* (new ed., Chicago, 1914); A. E. Shipley, *The Minor Horrors of War* (London, 1915); W. B. Herms, *Medical Entomology, including its Application to Public Health* (New York, 1915).

PARASOL (Fr. *parasol*, lt. *parasole*, from *para-*, parry, and *sol*, sun). A small umbrella made to use as a sunshade, usually with ornamented handle, and with silk covering of gay color, which is sometimes fringed, or trimmed with lace and embroidery. In the eighteenth century in Europe the parasol became peculiarly an article of feminine costume, having previously been used by both men and

women. The use of parasols in Italy appears to have been continuous from ancient to modern times, and was adopted by France in the sixteenth century and to a less extent by England in the seventeenth. The Chinese and the Japanese, men as well as women, use parasols of bamboo covered with paper printed in bright colors with pictures as well as purely decorative motifs. Large and elaborate parasols have from time immemorial been a mark of honor and official dignity in the Orient. We find them pictured on the walls of ancient Egypt and Assyria. In India in 1877 when the then Prince of Wales made his famous tour, he was compelled, in order to properly impress the natives, to ride upon an elephant and have over his head a parasol with frame of gold, and with covering stitched thick with precious jewels. See COSTUME and consult Octave Uzanne, *L'Ombrelle* (Paris, 1883).

PARASOL FUNGUS. See MUSHROOM.

PARATHYROID (pär'a-thí'roid) GLANDS. See ORGANOTHERAPY, SECRETIONS, INTERNAL.

PARAUÇU. See SAKI.

PARAY-LE-MONIAL, pa'râ'-le-mô'nyal'. A town in the Department of Saône-et-Loire, France, on the Bourbonne, 32 miles northwest of Macon (Map. France, N, K 6). Its Benedictine abbey, founded in 973, contains the tomb of Marguerite Marie Alacoque (q.v.). The revelations said to have been made to her greatly stimulated the devotion to the Sacred Heart of Jesus (See SACRED HEART OF JESUS, FEAST OF THE). Paray-le-Monial has consequently become a popular pilgrimage centre, and large numbers from Europe and America visit it annually. Pop., 1901, 4362, 1911, 4814. For an account of the apparitions, consult Bougand, *Histoire de la bienheureuse Marguerite Marie* (Paris, 1894).

PARCÆ (Lat., Fates, connected with *parere*, to bring forth, hence originally *Parca*, a goddess of childbirth, later associated by popular etymology with *para*, part, identified with the Gk. *Moira*, *Moiræ*, and then tripled into three *Parcæ* to correspond to the three *Moipai*, or Fates). The name given by the Roman poets to the Greek *Moiræ*, or goddesses of fate. They have no place in Roman worship, though the name appears in Gallic territory applied to Celtic divinities, who are also called *Fati* (masculine) or *Fatæ* (feminine). In the Roman poets they play an important part as spinners of the thread of life. Among the Greeks the conception of the *Moiræ* is somewhat different. The name in the singular denotes the portion of life allotted to each man at his birth, with the inevitable death at the appointed moment. In Homer *Moiræ* is the goddess who allots this portion to man, though it is often hard to tell whether the word is a proper name or a common noun, destiny. Here we find, however, *Moiræ* or *Aisa* as a spinner of a thread of destiny for every man at his birth, in one place she is associated with the *Klôthes*, or spinners, who work under her direction. From this idea of the spinner of the thread of life developed the conception of two or three goddesses who begin, control, and end this thread, but the *Moiræ* are named only once in Homer, and their development in the cult is of a later date. In Hesiod they appear as the three daughters of Zeus and Themis—*Clotho*, the spinner, *Lachesis*, the assigner of the lot, *Atropos*, the inflexible, who cuts the thread. They were worshipped in

Athens, Corinth, Sicyon, Sparta, Thebes, and elsewhere. They are gloomy, invisible goddesses, who know the future and at times reveal it. Their cult was in some places without images, and their offerings were those appropriate to chthonic divinities. To them honors were paid not only in connection with birth and death, but at any important epoch in human life. To a later period belongs the close division of functions between the three sisters, which does not appear in art till Roman times. In the earlier art they are not distinguished as individuals, but are represented only as fully draped female figures of youthful dignity. The so-called Fates of the Parthenon pediment are not certainly identified. Later Clotho is regularly indicated by the spindle, Lachesis by a globe, on which she traces the fate of man, or by little rods, from which she draws his lot, and Atropos by a roll or tablet, in which she records man's fate, or the sundial, to which she points. The relation of the Moiræ to the gods is not always clearly defined. In Homer the decree of Moiræ is in accord with the will of Zeus and once determined cannot be altered. Later writers, while keeping the connection with Zeus, seem at times to regard the Moiræ as binding even the gods. Later philosophical speculation naturally gave much attention to the Fates, and even in popular belief they held a high place among the gods. Consult C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

PAR/CENARY (OF. *parcenerie*, from *par-cener*, partner, from ML. *partitionarius*, having a share, from Lat. *partitio*, share, from *pars*, portion). At common law, the state of two or more persons, called *parceners*, who hold title to lands that have descended to them as equal heirs, so that though the estate is undivided each has a right to an equal share of it, without benefit of survivorship. See COPARCENARY; TENANCY IN COMMON.

PARC ET DE GOMBERVILLE, SIEUR. See GOMBERVILLE, MARIN LE ROY, SIEUR DU PARC ET DE.

PARCHÉ, pâr'shâ'. One of the small, beautiful coral fishes or butterfly fishes (*Chatodon capistratus*) common in West Indian waters. The name "parché" is sometimes applied to all the butterfly fishes. See PLATE OF CORAL FISH.

PARCHIM, or PARCHEM, pâr'kim. A town in the Grand Duchy of Mecklenburg-Schwerin, Germany, situated on the Elbe, 20 miles south-east of Schwerin (Map: Germany, D 2). It has a monument to Field Marshal Von Moltke, a native of the town. It manufactures cloth, chicory, celluloid, paper, tobacco, cigars, leather, and dairy products. Parchim is one of the richest cities of Mecklenburg, owning a good deal of the surrounding land. Pop., 1900, 10,242; 1910, 10,608, chiefly Protestants.

PARCH'MENT (OF., Fr. *parchemin*, from Lat. *pergamina*, *pergamenæ*, from Gk. *περγαμινή*, parchment, from *Περγαμηνός*, *Pergaménos*, relating to Pergamus, from *Πέργαμος*, *Pergamos*, *Πέργαμον*, *Pergamon*, a city of Mysia in Asia Minor, whence parchment was originally brought) and VELLUM (from OF. *velin*, Fr. *vélin*, vellum, from ML. *vitulinus*, relating to a calf, from Lat. *vitulus*, calf; connected with Gk. *ιταλός*, *italos*, Skt. *vatsa*, calf, from *vatsa*, Gk. *ἔτος*, *etos*, year). One of the oldest of writing materials, known at least as early as 500 B.C. Herodotus speaks of books written upon skins.

while Pliny, without good grounds, places the invention as late as 196 B.C., stating that it was made at Pergamum in the reign of Eumenes II, in consequence of Ptolemy of Egypt having prohibited the exportation of papyrus. Possibly the Pergamian invention was an improvement in the preparation of skins, which had certainly been used centuries before. The manufacture rose to great importance in Rome about the first century B.C., and its use spread over all Europe and retained its preëminence until the invention of paper from rags.

Parchment is prepared from the skins of sheep and goats; vellum from that of calves, kids, and dead-born lambs; the thick, common kinds, for drums, tambourines, battledores, etc., from those of old goats and in northern Europe from wolves; and a peculiar kind is made from asses' skins, the surface of which is enameled. It is used for tablets, as black-lead writing can be readily removed from it by moisture. The method of making parchment is at first the same as in dressing skins for leather. The skins are limed in the lime pit until the hair is easily removed. They are then stretched tightly and equally upon a square wooden frame called a herse. The flesh side is dressed as in currying, until a perfectly smooth surface is obtained. It is next ground by rubbing over it a flat piece of pumice stone, previously dressing the flesh side only with powdered chalk, and slaked lime sprinkled over it. It is next allowed to dry, still tightly stretched on the frame. The drying process is an important one and must be rather slowly carried on, for which purpose it must be in the shade. Sometimes these processes have to be repeated several times in order to insure an excellent quality, and much depends upon the skill with which the pumice stone is used and also upon the fineness of the pumice itself. Vellum is prepared with the finest pumice. When quite dried the lime and chalk are removed by rubbing with a soft lambskin with the wool on. The annual imports of parchment and vellum into the United States usually range in value from \$50,000 to \$75,000; in 1913 they amounted to \$59,466.

PARCHMENT, VEGETABLE, or PARCHMENT PAPER. When pure unsized paper is dipped into a cooled mixture of one part of water and two parts of sulphuric acid and then washed carefully with water and very dilute ammonia until every trace of acid is removed, and is then dried under pressure, a product is obtained in which the cellulose of the paper has been partly changed into amyloid or hydrocellulose, which forms a gelatinous coating over the swollen fibres and acts as a sizing. The parchment-like paper produced is translucent. A long-fibred unfilled paper, either cotton or linen, is preferred for the manufacture of this parchment. Paper shrinks 30 per cent in the process and increases three to four fold in strength, is impervious to liquids and gases, and does not mold. It absorbs colors and printing inks which cannot be erased. A good parchment paper will resist repeated boilings in water.

As parchment paper is liable to become highly brittle on standing, it is customary to treat it with dilute solutions of calcium or magnesium chlorides or glycerol to overcome this difficulty.

PARDESSUS, pâr'de-sû', JEAN MARIE (1772-1853). A French jurist and publicist, born at Blois, Aug. 11, 1772. He was educated to the law and early became distinguished for learning

and eloquence. He was made associate judge in his native city at 30 and mayor of Blois in 1805. His *Traité des servitudes*, published in 1806, established his reputation as a jurist and a writer of force and eloquence. It quickly reached eight editions. In 1809 he published *Traité du contrat et des lettres de change*, subsequently published under the title of *Cours de droit commercial*, which was considered the masterpiece of its time. His works on maritime law, *Collection des lois maritimes antérieures au XVIIIème siècle* (6 vols., 1828-45), *Us et coutumes de la mer* (1847), and his *Collection des ordonnances des rois de France*, were equally esteemed. In 1810 a professorship of commercial law was created for him in the law department of the Collège de France, where his lectures were notable. In 1815-16 and again in 1824-27 he was a member of the Chamber of Deputies. After the Revolution of 1830 he retired from public life. He died at Blois, May 26, 1853.

PARDO, pãr'dô, MANUEL (1834-78). A Peruvian statesman, born in Lima. He was educated in Santiago de Chile and in Europe, studied law and political economy, and received a government position in the Lima Bureau of Statistics in 1853. Five years afterward he was elected to the board of charities and, forgetful of self, did much to check the yellow-fever epidemic of 1867. In 1862 he founded the first bank in Lima. He entered the cabinet of President Mariano Prado in 1865, was President of the Tribunal of Commerce in 1868, mayor of Lima (1869), and President of Peru in 1872-76. He was the first civilian to hold that position, and his decrees in the interests of science, literature, and the public peace caused the people to remember him as a good ruler. He was afterwards President of the Senate. Probably at the instigation of officers who bore Pardo ill will for having reduced the army, he was assassinated in front of the Hall of Congress by a sergeant.

PARDO BAZÁN, bà-thân', EMILIA, COUNTESS OF (1851-). A naturalistic Spanish novelist and critic. She was born at Coruña, Sept. 16, 1851. After her marriage to Señor D. José Quiroga, in 1868, she went to Madrid, where she witnessed the revolutionary outbreak of that year. In 1876 she won a prize offered by the municipality of Oviedo for an essay on the Benedictine monk Benito Jerónimo Feijóo, well known in eighteenth-century Spanish literature. A journey through France, England, and Italy followed. Later Señora Pardo Bazán settled at Madrid, where she founded a review, the *Nuevo Teatro Crítico*. Her debt to Zola, whose determinism, however, she condemns, is most evident in her two strongest novels, *Los pazos de Ulloa* (1886) and *La madre naturaleza* (1887), in which she describes the decay of an aristocratic family. But her realism is Spanish rather than French, and she seeks a broad outlook on life. In *El cisne de Vilamorta* (1885) a romantic ending contradicts her naturalistic theories. Her descriptions of the life in her native Galicia are successful. Of her novels may be mentioned, besides the three noted above: *Pascual López*; *Un viaje de novios*; *La tribuna*; *La dama joven*; *Insolación*; *Morriña*; *Una cristiana*; *La prueba*; *La piedra angular*; and of her essays and critical treatises, *San Francisco de Asís*; *De mi tierra* (1888); *El Padre Luis Coloma*; *Pedro Antonio de Alarcón*; *La revolución y la novela en Rusia* (1887); *La cuestión palpitante* (4th ed., 1891), rhetorical

essays dealing with realism and naturalism in the modern novel; *Polémicas y estudios literarios*, a supplement to the matter contained in *La cuestión palpitante*, embracing also the account of her quarrel with the novelist Pereda (q.v.), and a review of some of the works of Galdós, etc. Her critical work, as well as her fiction, is of importance. She received her title of Countess in 1908 and in 1910 was appointed a member of the Council of Public Instruction. In 1891 her works had begun to appear in a uniform edition, as *Obras completas*. The first play that she wrote, *Verdad*, was published in 1905. Subsequent writings were: *Misterio* (1911), a novel; *Belcebú* (1912); *Cuentos Trágicos* (1913).

PARDOE, pãr'dô, JULIA (1806-62). An English author, born at Beverley, Yorkshire. Her father was Major Thomas Pardoe. She traveled in Portugal, was with her father for a time at Constantinople, and visited Hungary. Since Lady Mary Montagu, no woman had ever acquired so close a knowledge of Turkish life and manners, and out of this knowledge came, notably, *The City of the Sultan and Domestic Manners of the Turks* (2 vols., 1837). In 1859 she was granted a civil-list pension of £100. She died in London, Nov. 26, 1862. In her fourteenth year Miss Pardoe published a volume of verse, which went into a second edition. Afterward she became a popular novelist, writing *Lord Morcar of Hereward* (1829), *The Hungarian Castle* (1842), etc. Her miscellaneous works are descriptions of the lands and peoples she had visited and graceful essays on French history. Among them are: *Traits and Traditions of Portugal* (1833); *Louis XIV and the Court of France* (1847); *The Court and Reign of Francis I* (1849; reprinted with memoir 1887); *Life and Memoirs of Marie de' Medici* (1852); *The Romance of the Harem* (1839, 1857); *The Beauties of the Bosphorus* (1839); *The City of the Magyar* (1840); *Episodes of French History during the Consulate and the First Empire* (1859).

PARDON (OF, Fr. *pardon*, from ML. *perdonum*, pardon, from *perdonare*, to grant, from Lat. *per*, through + *donare*, to give, from *donum*, gift). An act of grace, exercised by a competent authority, remitting the penalty imposed by law upon a person who is either guilty or accused of a crime or offense against the state. The earliest records of governments contain instances of the exercise of such a power by the sovereign authority, relieving an offender from the consequences of a violation of a tribal rule or later of a national law. The main reasons for vesting the chief executives of modern nations with the wide discretion which they exercise in this regard are to prevent injustice because of the fallibility of human laws, which sometimes work hardship in individual cases, although they may be salutary on the whole; the possibility that a person may be unjustly accused and convicted, which may not be discovered until long afterward; to make it possible for the supreme authority to release persons convicted and sentenced under harsh and oppressive laws, especially political offenders convicted in a time of great public excitement and discord; to enable the chief executive to reward in this manner repentance and good conduct in prison, where he is satisfied that a thorough reform has been effected, and justice satisfied; and, generally, for reasons of state.

In England this power has always been vested in the King and in early times seems to have been shared to a certain extent by the Lords of the Marches. In 1536 a statute was enacted (27 Hen. VIII, c. 24) restricting the right to the King and prohibiting him from delegating it to any subject within the realm. At present the crown exercises its prerogative upon the advice of the Secretary of State for the Home Department. Parliament has from time to time imposed certain restrictions on the exercise of the pardoning power. A pardon cannot be pleaded as a defense to an impeachment by the House of Commons. By the Habeas Corpus Act of 1679 the crown cannot pardon the offense of sending a person to prison without the realm. Where the pardon of an offense will work an injury against an innocent person, it will only be operative as far as the culprit's liability to punishment by the crown is concerned and will not affect his civil liability to a person injured by his crime.

In the United States the power to pardon offenses against the national government is vested, by the Constitution, in the President. His power is absolute, except as to impeachments of public officers, and rests entirely in his discretion, not being subject to legislative control. Perhaps the greatest number of pardons are granted to soldiers guilty of a breach of the military regulations, especially to volunteers who are unused to rigid military discipline. In most of the States the pardoning power is vested in the Governor alone. Several of the States require the concurrence of one branch of the Legislature, and in a few boards of pardons have been established, of which the Governor is usually a member *ex officio*. Applications for a pardon are usually presented in the form of petitions by the persons seeking pardon, supported by letters and affidavits of responsible people setting forth the extenuating circumstances of the case, and the previous good character of the convicted person; and formal hearings on such applications are often held. The necessity for the exercise of this power is greatly lessened in some States by statutes allowing a graduated commutation of a term of imprisonment as a reward for repentance and good conduct in prison. Many penal statutes also allow wide discretion to the trial judge as to the sentence to be imposed, in the exercise of which he may consider extenuating circumstances, etc., just as a Governor would do on an application for a pardon. The system of releasing prisoners on parole (q.v.), and of suspending sentence of convicted persons, is also a development of the idea of pardon.

A pardon may be absolute or conditional. In the latter case it goes into effect or, as the case may be, ceases to have effect on the happening of the condition. Thus, a prisoner may be released on condition that he leaves the State forever. On violation of the condition the expirer may be again remanded to serve out his original term. A general pardon extended to political offenders, such as rebels, is usually called an act of amnesty (q.v.). A pardon is more sweeping in its effect than a reprieve, which only operates as a suspension of sentence. A full pardon effects a remission of the punishment and generally removes the legal disabilities which follow conviction, so that a person who is pardoned is, in law, as innocent as if he had never committed the crime, except that it does

not restore forfeited property or fines. In most American States, moreover, a pardon does not of itself operate to restore a person who has been convicted of an infamous crime to the rights of citizenship forfeited by him unless such restitution is expressly made by the pardoning power. In some States, where a final conviction of murder and sentence of death operate as an absolute divorce of husband and wife, the pardon of a convicted spouse does not operate to restore the marital relation. A pardon obtained by deception or fraud is void, and on discovery of this fact the convicted person may be again committed to serve out his term. Consult the authorities referred to under CONSTITUTIONAL LAW; CRIMINAL LAW.

PARDONER'S TALE, THE. In Chaucer's *Canterbury Tales*, the story of three rioters who pledge themselves to find and destroy Death, but conspire against each other, and die.

PARDOW, pär'dô, WILLIAM O'BRIEN (1847-1909). An American Jesuit priest, born in New York City. After graduating at St. Francis Xavier College in 1864, he continued his studies at Woodstock College and in France. He served as president of St. Francis Xavier in 1891 and as provincial superior of New York and Maryland in 1893, was curate of the church of St. Ignatius Loyola, New York, in 1901-03, lectured at the Jesuit Institution in 1903-06, and thereafter until his death was curate of the church of Gesu, Philadelphia. Farther Pardow was identified with the Modernist movement and was regarded by many as the greatest Catholic preacher in the United States.

PARDUBITZ, pär'du-bits. A town of Bohemia, Austria, situated at the confluence of the Chrudimka with the Elbe, 12 miles south of Königgrätz (Map: Austria-Hungary, D 1). It has an old palace (a former stronghold of the lords of Pernstein), several important churches, a large Rathaus, and a higher Realschule. Its manufactures comprise spirits, sugar, agricultural machinery, iron products, musical instruments, lumber, and flour. It is an important horse market. Pop., 1900, 17,029; 1910, 20,419, chiefly Roman Catholic Czechs.

PARÉ, pä'rä', AMBROISE (1517-90). A French surgeon, born at Laval, Department of Mayenne. He was apprenticed to a barber in Paris, studied anatomy and surgery, became an assistant at the Hôtel Dieu, and in 1536 entered the army as a surgeon. During the military operations in Italy he acquired a great reputation as a skillful surgeon. He introduced the practice of ligating arteries in bleeding wounds in place of the fashion which then prevailed of cauterizing them with boiling oil. Although to him we owe the use of trusses in hernia, the employment of massage, and other innovations, it is on the ligating of arteries that his fame as "the father of modern surgery" chiefly rests. On his return to Paris in 1539 he was received with distinction by the Royal College of Surgery and was subsequently made its president. War being renewed, he again entered active service, this time introducing the practice, after amputations, of using ligatures instead of cauterization with hot irons. Honors were showered upon him, even learned titles and degrees, though Paré was ignorant of Latin, then the *conditio sine qua non* of a liberal education. He became surgeon to Henry II, Francis II, Charles IX, and to Henry III. It has been stated that by order of the King he

was spared at the slaughter of the Huguenots in the night of St. Bartholomew.

Paré's writings have exercised a profound influence on the practice of surgery. He was the first surgeon to write (perforce) in his native tongue instead of in Latin. His best-known works are his treatise on gunshot wounds, *La manière de traiter les playes* (1552); on surgery, *Deux livres de la chirurgie* (1564) and *Deux livres de chirurgie* (1573); on the pest (1568); on monsters (1573); and against the use of mummies and unicorns in therapeutics, *Discours à scavoir, de la mummie, des venans, de la licorne, et de la peste* (1582). A complete edition of Paré's works, edited by Malgaigne, appeared at Paris in 1840-41. Besides this are eight Latin editions and more than 15 translations. Consult Stephen Paget, *Ambroise Paré and his Times* (New York, 1897); and the *Life* by Paulmier (Paris, 1884). See MEDICINE, HISTORY OF; and SURGERY, MILITARY.

PAREGORIC (Lat. *paregoricus*, from Gk. *παρηγορικός*, *parēgorikos*, soothing, from *πατήρ*, *patēr*, father, *parēgoros*, consoling, from *παρά*, *para*, beside + *ἀγορεύω*, *agoreúō*, to talk in assembly, from *ἀγορά*, *agorá*, assembly). The camphorated tincture of opium of the *United States Pharmacopæia*. An alcoholic solution of opium, benzoic acid, camphor, and oil of anise, every fluid ounce containing two grains each of opium, benzoic acid, and camphor, and two minims of oil of anise. This preparation is much used both by the profession and the public. It is an excellent remedy for the chronic winter cough of old people, the opium diminishing the bronchial secretion and the sensibility of the pulmonary mucous membrane, while the benzoic acid and oil of anise act as stimulating expectorants. The volatile oil and camphor render paregoric particularly useful in diarrhoea. The preparation is often improperly given to children by careless or ignorant parents to quiet them and relieve pains in the bowels. Children are peculiarly susceptible to opium, and much harm is done by its regular administration.

PA'REIASAURUS (Neo-Lat., from Gk. *παρεία*, *pareia*, cheek + *σαῦρος*, *sauros*, lizard). A remarkable fossil Cotylosauria, of which a few quite complete skeletons have been found in the Permian Karoo formation of South Africa. The animal was large, about 9 feet in length, of massive build, with very short stout limbs and a short tail. The skeleton presents a most peculiar squat appearance and in some respects suggests that of the turtles. There were a few rows of small dermal scales on the back.

PA'REIRA BRAVA, pá-rá-rá brí'vá (Portug., from Brazilian *pareira*, the native name, and Portug. *brava*, brave, strong). The root of *Chondrodendron tomentosum*, used to some extent medicinally as a diuretic, which for a century was supposed to be the root of *Cissampelos pareira*, but was identified by Hanbury in 1872. The plant is a tall, woody climber, a native of Brazil and Peru, belonging to the family Menispermaceæ. It has large, ovate-cordate, fine-nerved leaves, very small unisexual flowers, and purplish black, ovoid, one-seeded drupaceous fruits, resembling grapes. As it comes to market the root is in short, thick, dark-brown pieces, externally ridged and fissured transversely and irregularly furrowed longitudinally. It is nearly odorless and has a bitter taste. The stem is sometimes found mixed with the root, which it much resembles, but may be distinguished by

the pith. The roots of several other menispermaceous plants have been sold for *pareira brava*. There is a yellow *pareira brava* exported from Brazil in the form of flat twisted stems which has been thought to be obtained from *Aristolochia glaucescens*. It may be detected by the eccentric arrangement of its woody zones, which in the genuine are symmetrically concentric. See CISSAMPELOS.

PAREJA, pá-rá'há, JUAN DE (1606-70), called El Esclavo (the slave). A Spanish religious and portrait painter. He was born at Seville, the son of Moorish parents, and was the slave of Velazquez. He assisted his master in the studio, all the while secretly studying his art. By an artifice he succeeded in bringing one of his pictures to the attention of Philip IV, while he was visiting Velazquez's studio, who immediately set him free. He continued to serve Velazquez, though enrolled among his pupils, and after the latter's death he served his daughter. His paintings are quite in the manner of his master. The most notable are: "The Calling of St. Matthew," in the Prado Museum, Madrid; "Baptism of Christ," Huesca Museum; and the portrait of the architect Rates. Other works ascribed to him are in the galleries at St. Petersburg and Dulwich.

PARENCHYMA, pār-ēp'kí-má (Neo-Lat., from Gk. *παρέγχυμα*, tissues of the lungs, liver, kidneys, and spleen). A plant tissue composed of living (usually thin-walled) cells whose three dimensions are approximately equal. Sometimes the term is applied to elongate cells. Parenchyma represents the primitive, undifferentiated tissue of a plant, from which the other tissues have been derived. It is really the parent tissue. See HISTOLOGY.

PARENT, pá-rán', ETIENNE (1801-74). A Canadian journalist and philosopher. He was born at Beauport, Province of Quebec, and was educated at Quebec Seminary and at Nicolet College. Early recognition of his unusual abilities procured for him when 21 the editorship of an influential newspaper, *Le Canadien*. This position he held for three years. He afterward studied law, was called to the bar in 1828, but practiced his profession only a short time, having accepted the position of French translator, and subsequently librarian, to the Lower Canada Legislative Assembly. In 1831-42 he was again editor of *Le Canadien* and advocated responsible government and other reforms with such boldness that he was imprisoned in 1837-38. He was elected a member of the Canada Legislative Assembly in 1842, after Upper and Lower Canada were united in one province. In 1842-47 he was clerk of the Executive Council, then for 20 years Assistant Secretary for Lower Canada, and in 1867 became acting Assistant Secretary of State for Canada. Parent was probably the ablest writer on economic, religious, and political topics that French Canada has produced and did more than any other person to promote an intellectual revival in that province. In a series of public lectures, afterward printed in the *Payer Canadien*, he sought to enlighten his racial compatriots as to their true industrial and political interests, giving special attention to wage earners and popular education and appearing also as the philosophic defender of the Catholic religion as necessary to spiritualize social life. In the latter respect his attitude was liberal, though not to the point of openly breaking with the ecclesiastical au-

thorities. He published: *Du travail chez l'homme* (1847); *Importance de l'étude de l'économie politique* (1847); *L'Industrie considérée comme moyen de conserver notre nationalité* (1848); *Du prêtre et du spiritualisme dans leurs rapports avec la société* (1848); *De l'importance et des devoirs du commerce* (1852); *De l'intelligence dans ses rapports avec la société* (1852); *Considérations sur le sort des classes ouvrières* (1852). Consult Abbé Camille Roy, "French-Canadian Literature," in *Canada and its Provinces* (Toronto, 1913-14).

PARENT, SIMON NAPOLEON (1855-). A Canadian statesman, born at Beauport, Province of Quebec, and educated at Quebec Normal School and Laval University. He was called to the bar in 1881, practiced in Quebec, and became a leader in his profession. Parent was an alderman of Quebec City (1890-94) and mayor (1894-1905), a Liberal member of the Legislative Assembly (1890-1905), and Commissioner of Lands, Mines, and Forests (1897-1900) in the Marchand administration; and in 1900-05 Prime Minister of Quebec and also Minister of Lands, Mines, and Fisheries. In 1905-11 he served as chairman of the National Transcontinental Railway Commission.

PARENT AND CHILD. Under this head are usually treated the legal relations which exist between father or mother and children. The legal is to be distinguished from the natural relation, for two persons may be by the law of nature parent and child, while they are not legally so. Conversely, the legal relation may exist although there is no natural relation. Hence a radical distinction exists between natural, or illegitimate, and legitimate children, and their respective legal rights with relation to their parents are very different.

Early Law. While the legal relationship between mother and child has always been based on the fact of maternity, that between father and child was originally based, not on the fact of paternity, but on the husband's power over the child's mother. Marriage, as we find it at the dawn of European history, was the appropriation of the woman by the man; and as the husband's authority over his wife was originally not differentiated from other property rights, so the power of the father over children born of the wife was originally indistinguishable from ownership. Wife, children, slaves, and things were equally *in manu*, i.e., "in, or under, the hand," of the head of the house. The father had the power of life and death over the child as well as the right to sell it. The marriage of a daughter, which usually took on the form of a sale and which put her "in the hand" of her husband, of course carried her out of the father's power, and paternal authority over the son ended, among most of the Indo-European peoples, when the son established a household of his own. The lifelong paternal authority (*patria potestas*) of the Roman father seems to have been exceptional; it resulted from the Roman custom by which the son brought his wife into his father's house.

Of maternal authority over children, even when illegitimate, there is little trace in early law, because the woman was regularly herself "in the hand" either of father or of husband or kinsman during her whole life. In early Frisian law, however, the mother had the same right as the father to kill her new-born child.

The earliest restraints upon the power of the

head of the house were exercised by his kinsmen, and to some extent by those of his wife, and, when the family was recognized as a religious institution, by the priests. These restraints, which at an early period began to lift the wife out of the position of a mere chattel, affected but slightly the position of the child. (For that of the Roman child, see *PATRIA POTESTAS*.) In the old German law of the heathen period the infant was not to be exposed after it had been sprinkled with water and had received its name; nor was a child to be put to death subsequently without cause, nor to be sold except when the parents were in dire need. With the acceptance of Christianity by the Germans, the right of exposure disappeared, but the paternal power of punishment for crime and of sale in case of necessity were not at first affected. As regards personal property, all that the unmarried daughter or the son living in the paternal house acquired was acquired for the father. With respect to real property, however, the children's eventual rights were protected; inherited realty of the parents was "tied up" in the interest of the children, and a sale by the father conveyed no perfect title to the purchaser.

Mediæval Law. In the course of the Middle Ages the authority of the father assumed more and more the aspect of a natural guardianship and less of a property right. The mother, also, having herself become emancipated from the hand of her husband, acquired a subordinate authority. After the death of the father, or when he was incapable of exercising control over the children, the mother became their natural guardian.

The canon law introduced into the mediæval law of parent and child but one important modification, viz., the legitimation of children born out of wedlock by subsequent marriage between the parents. This rule was borrowed from the Roman law, but was extended by the Church; at Roman law it applied only to children of a concubine, at canon law it applied to all illegitimate children. When it came, however, to recognizing such children as heirs of real property, the Church encountered obstinate resistance. In many parts of Europe the Germanic law held its own, especially as regards the inheritance of entailed estates. The reception of the civil law had little influence upon the European law of parent and child, for the *patria potestas* of the Roman law was not generally received.

Modern European Law. In central and western Europe, exclusive of England and Ireland, maternity is purely a question of fact; paternity is based on the presumption that the child born or conceived in wedlock is the husband's child, but proof of the contrary is permitted. The child born out of wedlock, if "recognized" by the father, or if the fact of paternity be established by judicial inquiry, is entitled to support up to a certain age and has rights of succession in the paternal estate, but not the same rights as legitimate children. In the French law, however, inquiry into the paternity of the illegitimate child is not allowed, and such a child has no rights against the father unless it has been recognized. The legal relation of the parent and child is regularly established by birth in wedlock, by legitimation, or by adoption. A child born out of wedlock is legitimized by the subsequent marriage of the parents accompanied by recognition of the child; and in some countries (e.g., in Spain and in Germany) the child may be legitimized by ad-

ministrative decree issued at the father's request. Adoption is usually permitted only when the adopting parents are childless. Legitimation and adoption generally give parent and child the same rights which pertain to the parent and to the child born in wedlock.

The authority of the parent over the person of the child is that of a guardian; i. e., the element of duty is more emphasized than that of authority. In the exercise of parental authority the voice of the father is decisive, so that the parental rights of the mother become legally effective only when the father is dead, or when he is unable to exercise his rights or has been deprived of them by a decree of court. The administration of the property of children belongs to the parents—to the father as of right; to the mother, usually, only with the authorization of the family council or of the court—and in most of the codes the parents are not obliged to account for the income, their rights being those of usufructuaries; but where property is given or bequeathed to a child, the donor or testator may exclude this parental usufruct and even the parental administration. The parental usufruct is also excluded as regards money and property acquired by the child's separate labor and industry. In case of divorce or annulment of marriage, the control of the persons and the property of the children is regulated by order of the court. The authority of the widow or divorced wife over her children and her usufructuary rights are in all civil legislations impaired by her remarriage; and the German law makes provision for safeguarding the interests of children of the first marriage when the father marries again. Parental authority is extinguished when the child reaches full age or is emancipated. In many legislations, however, parental consent is necessary for the marriage of a child even after the child has reached full age. See MARRIAGE.

The chief duties of parents are the suitable support and education of their children. In many of the civil codes they are also bound to provide daughters with dowries. Parents are responsible for debts contracted by their children without their authorization only as a result of the duty of support and education (i. e., they are liable only for necessities). In most legislations they are liable for all torts committed by children; at German law, however, the parent is responsible only when the tort could and should have been prevented by him, i. e., when he has failed to exercise proper surveillance and control.

The Common Law. Legitimate Children.—By the common law of England and the United States the parents are the legal as well as the natural guardians and protectors of the child. They have the right to name the child and are entitled to his custody. As such custodians, they or persons *in loco parentis* may reasonably chastise the child, but for excessive punishment, amounting to willful or malicious cruelty, the parent may be civilly liable in an action of tort, or criminally liable for assault, or for homicide in case death ensues. At common law the parents could not be deprived of the custody and control of the child by third parties, but by modern legislation officers having supervision over public charities, and in some States private charitable corporations, may by proper legal proceedings acquire custody of the child, if subjected to cruel or improper treatment by the

parents. At common law, as between the father and mother, the father was deemed to be entitled to the custody of the child, but by Stat. 36 Vict., c. 12 (1873), the Court of Chancery may award such custody to the mother if it appears to be for the best interests of the child. This parental jurisdiction of the courts has been enlarged by subsequent legislation. (See particularly Stats. 49 and 50 Vict., c. 27; 56 and 57 Vict., c. 54; the Custody of Children Act, 1891, 54 Vict., c. 3, and the Prevention of Cruelty to Children Act, 1904, 4 Edw. VII, c. 15, § 6.) It is now the practice of courts generally in the United States, even in the absence of statute, to award the custody of the child to the parent best qualified and able to care for it.

In case of divorce or judicial separation of the parents, even in the absence of statute, courts having jurisdiction over divorce generally have jurisdiction to award custody of the children of the marriage. The right to custody may also be determined in a proper case by habeas corpus (q. v.), or in some States upon application to courts of probate or similar courts having statutory jurisdiction over the subject matter. If the parents separate by agreement, no stipulation entered into by them as to the custody of the child will be enforced by the courts if prejudicial to the child.

A parent or one *in loco parentis* is entitled to the services of a child until he comes of age, and if the services are rendered to others the parent is legally entitled to recover the reasonable value thereof unless payment is made to the child with the consent of the parent. As between the father and the mother, the father is entitled to the child's services, but upon the death of the father or upon custody of the child being awarded to the mother, she becomes entitled to the child's services. The right of the parent to take the child's earnings may be waived by his voluntary emancipation of the child. See EMANCIPATION.

Parents, as such, have no interest in or control over the property of their children, such control being exercised by guardians appointed by courts of chancery or probate having jurisdiction over the property of infants. (See GUARDIAN; WARD.) Wearing apparel and personal effects, however, purchased by the parent for an infant child remain the property of the parent and subject to his control. Rights of action belonging to the infant might be enforced at common law by an action brought by the parent as "next friend" (*prochein ami*) of the infant; and now by statute generally such actions are prosecuted in the name of the infant by a guardian *ad litem* appointed by the court, who may be but is not necessarily a parent of the litigant.

As the parent is legally entitled to the services of the child, any wrongful act of third persons interfering with this right is a tort, for which such third persons must respond in damages to the parent. Thus, a parent may recover all damages suffered by him by reason of loss of services of his child because of personal injuries inflicted upon the child by the negligent conduct of third persons. And in most jurisdictions he may recover also for the medical attendance supplied to the child.

Upon similar principles the parent may recover damages for the seduction of an infant daughter. Indeed, by the early law, as well as

in some States at the present time, the parent's right to recover for the seduction was based solely upon his right to recover for the loss of his daughter's services. The courts of some States, however, have departed from this rule and permit a recovery, even though the parent has emancipated his daughter and is therefore no longer entitled to her services. See **SEDUCTION**.

As regards the maintenance of the child, it is somewhat singular that according to the common law the parent is under no civil duty whatever to support the child. This defect in the law was partially remedied by the Poor Law, enacted by Parliament in the reign of Elizabeth, by which some legal duty was imposed upon parents and children to support each other when financially able to do so, or rather to assist the parish authorities in contributing to their support.

Similar statutes have been enacted in most of the United States, and in a few States the courts have indicated that the duty of a parent to maintain his child may also be enforced by third persons supplying necessities by an action in the nature of quasi contract.

While the parent is not at common law civilly liable to maintain his child, he is nevertheless criminally responsible if he neglects it and, by exposure or failure to provide it with food or clothing, causes the child's injury or death. Parents have been held guilty of manslaughter and even murder when death resulted from negligent or improper care of their children. The English courts have held that a parent who in good faith neglects to provide medical attendance for his child because he did not believe in the use of medicine was not criminally responsible for his neglect. The rule of this decision was promptly corrected by an act of Parliament, and it is now generally the law in the United States that a parent guilty of gross neglect in not providing proper medical attendance for his child is criminally responsible.

At common law a parent is not liable for the torts of his child unless their commission is incited or authorized by the parent, in which case the rules for determining his liability are the same as in the law of agency or master and servant.

At common law the child is an heir of the parent, subject in England to the rule of primogeniture (see **DESCENT**), and is also entitled to a share of the parent's personal estate under the various statutes of distribution (q.v.). This interest of the child in the parent's property may however be defeated by the parent's will, which may dispose of all his property to strangers. In several States it is provided by statute that children of a testator born after the execution of his will and of whom no mention is made in the will shall take the same share in the parent's property which he would have secured had the parent died intestate.

Illegitimate Children.—In strictness of law an illegitimate child, i.e., one born out of wedlock, has no parent, and consequently he has no rights as against his natural parents, and they owe him no corresponding obligation. Unmarried parents at common law were therefore not bound to support their illegitimate child, and in case of their death intestate he acquired no interest in their property as heir or next of kin. The English Bastardy Act (4 and 5 Wm. IV, c. 76, and 35 and 36 Vict., c. 63), which has

been substantially reenacted in most of the United States, has qualified the common-law rule as to the duty of parents to maintain their illegitimate children.

The English statute provides as follows: The father is not bound even by the poor laws to maintain the child, and the parish officers cannot institute any proceedings whatever against him for this purpose; but the mother or the guardian of the child may to a certain extent compel him to contribute towards the child's maintenance and education. The poor laws make the mother liable to maintain the child until it attains the age of 16; and not only is she so bound, but any man who marries her is also bound to support all her illegitimate children until they attain that age. As regards the custody of illegitimate children, the mother is the party exclusively entitled, for the father is deemed in point of law not to be related to such child. Yet, if the father has in point of fact obtained the custody of such child, and the child is taken away by fraud, the courts will restore the child to his custody, so as to put him in the same position as before.

The bastardy statutes in the United States in general differ only in minor particulars from the English statute. One important difference, however, is a provision generally adopted authorizing the poor officers or other designated officials to bring bastardy proceedings directly against the putative father without the intervention of the mother. Although the father of an illegitimate child is under no direct positive obligation to support his child, the natural relationship has been held in some States to be a sufficient consideration to support and render enforceable the father's promise or agreement with third persons to pay for the support of the child even if made after the support has been given.

In some States also illegitimate children are by statute made heirs at law of the mother. Such is the law in New York, provided the mother leave no legitimate children. The mother may also inherit from her illegitimate child.

Bibliography. Fraser, *Treatise on the Law of Scotland Relative to Parent and Child*, etc. (2d ed., Edinburgh, 1886); G. W. Field, *Legal Relations of Infants, Parent and Child*, etc. (Rochester, 1888); Arndts, *Juristische Encyclopædie* (9th ed., Stuttgart, 1895); James Schouler, *Treatise on the Law of Domestic Relations* (5th ed., Boston, 1895); W. P. Eversley, *Law of Domestic Relations* (3d ed., Toronto, 1906); Shearon Bonner, *Common Law of Husband and Wife and Parent and Child* (Dallas, Tex., 1913); and the authorities referred to under such titles as **CONTRACT**; **DIVORCE**; **DOMESTIC RELATIONS**; **HUSBAND AND WIFE**; **MARRIAGE**; **ETC.**

PARENZO, pá-rén'dzò (Lat. *Parentium*). A town on the west coast of the Crownland of Istria, Austria, situated on a rocky peninsula, 35 miles south by west of Trieste (Map: Austria-Hungary, C 4). It is the seat of the Provincial Assembly and of a Roman Catholic bishopric and has a good harbor. Its principal building is the cathedral of St. Maurus, a basilica of the sixth century containing fine mosaics. There are also ruins of Roman buildings; the smaller relics of that period are contained in the museum of the Istrian Archaeological Society. The chief occupations are fishing, ship-

building, and trade. Pop., 1911, 17,523, mostly Italians. Parenzo was a Roman colony, Parentium; it became a part of the Venetian Republic in 1267 and remained so until its dissolution. The bishopric of Parenzo was founded about 524 and united with that of Pola in 1827.

PAREPA-ROSA, EUPHROSYNE (1836-74). An English soprano. She was born at Edinburgh and was the daughter of Georgiades de Boyescu, a Wallachian nobleman, and Elizabeth Seguin. She studied under Crescentini, Panseron, and Bordogni and made her first appearance as a singer at Malta under the name of Parepa. She made her debut in London in 1857 and in 1863 married Captain Carvell, who died two years later. She then went to America and appeared at Irving Hall, New York, in 1865. In 1867 she married Carl Rosa, the violinist and operatic manager and conductor, with whom in 1869 she organized an English opera company. Her voice was remarkable for its purity and flexibility and had a compass of two and one-half octaves. She died in London.

PARESIS, *pār'ê-sis* (Neo-Lat., from Gk. *πάρεσις*, letting go, paralysis, from *παρίεναι*, to relax, from *παρά*, *para*, beside, beyond + *lévai*, *hienai*, to let go, send), **GENERAL PARESIS**, **PARETIC DEMENTIA**, **DEMENTIA PARALYTICA**, **GENERAL PARALYSIS OF THE INSANE**, popularly but improperly called **SOFTENING OF THE BRAIN**. "A chronic progressive psychosis, characterized clinically by mental, motor, vasomotor, and sensory symptoms, and pathologically by organic changes in the brain and spinal cord, probably toxic." (Starr.)

Etiology. The disease is five times more prevalent in males than in females and occurs especially between the ages of 35 and 40, rarely earlier than 25 or after 55. In 50 per cent of the cases defective heredity is noted, but it is not causative. Large cities and manufacturing centres furnish by far the most cases; it is rare in farming districts. It is now conceded that the cause is syphilis, which operates to produce the disease in patients undermined by alcohol, sunstroke, head injury or mental shock, in most instances, through a profound disturbance of metabolism, which develops a toxin causative of the pathological changes.

Pathology. The earlier changes consist of congestion of the vessels of the brain and pia mater, exudation of serum into the perivascular lymph spaces, and an increase in the nuclei and cellular elements of the walls of the vessels. Following these vascular changes, and probably in a measure dependent upon them, is an increase in the neuroglia or connective tissue of the brain. This neuroglia increase often goes on quite rapidly and determines a corresponding shrinkage and atrophy of the nervous tissue proper. As the process continues there are degenerative changes in the nerve cells and fibres, with pigmentation and the formation of cyst-like cavities. There are usually an increase of fluid in the ventricles and thickening of the ependyma. With the full development of the lesion the brain atrophies, becomes shrunken, weighs less than the normal brain, the convolutions are smaller and the sulci more widely open. These changes affect the whole brain, but are most marked in the frontal and parietal lobes. Accompanying the brain lesions there are often a chronic meningitis and sclerosis of the posterior columns of the cord. Sclerosis of the lateral columns may also occur.

Symptoms. The onset is gradual. It is first noticed by friends that the patient does not seem in his usual frame of mind. He is irritable, either depressed or excitable, is growing distractible and inattentive, and disoriented. He soon becomes inattentive to business, but plans absurd projects of great magnitude and very numerous, which involve expense entirely out of proportion to the man's means. The patient feels well, often saying that he never felt better in his life. A marked egotism usually develops. He boasts of his wealth, power, and abilities, even when tottering about, unable to write or to dress himself. Soon he becomes forgetful, careless, inattentive, unable to carry on a logical argument. This becomes noticeable in his conversation, which is disconnected. The memory defect is marked, especially in the time element for recent events. Finally, remote memory also suffers, and entire lapses occur. The patient tells of his ivory vest with diamond buttons, his yachting trip to Honduras and back during the morning, his purchase of a million shares in the stock market, his hundred beautiful Circassian wives. Headache and sleeplessness are common, and there is a marked loss in weight and in strength. Even though previously a man of exemplary habits, the patient becomes neglectful of the ordinary proprieties of life, uses bad language, ignores family obligations, loses his temper, and indulges in sexual and alcoholic excesses. This condition lasts from one to three years and passes over gradually into a fully developed dementia. This condition is marked by an increase in the symptoms above described. Egotism is usually a marked feature, and delusions of grandeur are the rule. Instead of exaltation there may be depression, which is frequently the case in women, or melancholy and elation may alternate. Illusions and delusions are common, hallucinations less frequent; but there are no fixed systematic delusions, as is the case in paranoia. The emotions are in a state of unstable equilibrium. The patient is easily moved to laughter or tears. Slight causes produce intense excitement, which may take the form of rage or frenzy, rendering the patient dangerous to his fellows. There is rarely any suicidal tendency. Self-control is weakened, and consequently voluntary actions are weak, irresponsible, and impulsive. Self-consciousness is impaired, the patient failing to appreciate his changed mental condition. He is contented wherever he is, is not concerned about the anxiety of his friends, loss of money or business, or even in the least about hospital confinement. Of motor symptoms, tremor of the tongue and face muscles appears first. Later almost any motion is attended with trembling. This results in thickness of speech and in clumsiness in the finer coördinate movements, such as writing. These motor symptoms gradually pass over into a paralysis, which becomes increasingly widespread and increasingly complete. The patient may lie for a year or two on a water bed, unable to move any but the muscles of swallowing, voluntarily. There is also marked increase or marked decrease in the reflexes, with retention of urine and loss of control of the rectum. Of sensory symptoms, headache, tinnitus, disordered sight are early symptoms, while anæsthesia and analgesia are late manifestations. Bed sores and cystitis are very common. The average duration of the disease is four years,

but well authenticated cases are on the records of hospitals concerning patients who survived for nine years. In the early stage of the disease there may be transient paralysis of one arm or one leg. There may be convulsions occurring at intervals of a few days, which may be mistaken for epilepsy. In the last stages convulsions are usual and severe. Death results from exhaustion, frequently from convulsions, from cerebral hemorrhage, or from some intercurrent complication, such as pneumonia, cystitis, or obstruction of the bowels.

Treatment. Antisyphilitic treatment is often detrimental, but it may be tried in the early stages, with enforced rest, diet, massage, and careful hydrotherapy (prolonged warm baths, also cold packs). Later the treatment is entirely symptomatic, tonic, sedative in conditions of excitement, while in the later stages confinement in an institution or constant home care is necessary. Consult: A. R. Diefendorf, *Clinical Psychiatry*, adapted from Emil Kraepelin, *Lehrbuch der Psychiatrie* (2d ed., New York, 1907); Clark and Diefendorf, *Neurological Mental Diagnosis* (ib., 1908); Joseph Rogues de Fursac, *Manual of Psychiatry*, translated and edited by A. J. Rosanoff (3d Amer. ed., ib., 1911). See **INSANITY**; **PARALYSIS**.

PARFLECHE, pār-flēsh'. A name of French origin, applied to a peculiar flat rectangular rawhide bag of Indian make, the front of which is decorated with geometric designs. In museums parfleches are the most conspicuous object in collections from the Plains Indians. See **INDIANS, AMERICAN**.

PARGA, pār'gā. A town in the Kingdom of Greece, situated on the shore of the Ionian Sea, opposite the island of Paxos (Map: Balkan Peninsula, C 5). It is built on a steep cliff, surmounted by an almost impregnable citadel, and has a harbor defended by a small island. Parga, founded in the last days of the Roman Empire, was independent and under the protection of Venice from 1401 to 1797, when it was for a short time governed by the French. In 1814 Ali Pasha, Governor of Albania, besieged it, and the people applied to the British for aid. Great Britain took possession of the fortress, but in 1819 handed it over to Ali Pasha. Thenceforth until its capture by the Greeks in 1912, Parga was an unimportant town of the Ottoman Empire in the Vilayet of Janina. Its cession to Greece was confirmed by the Treaty of Bucharest (Aug. 6, 1913). Its present population is about 5000.

PAR'GASITE (named from *Pargas*, Sweden, where it is found). A name applied to the green and bluish-green varieties of hornblende. Pargasite is usually found in the form of stout lustrous crystals, although sometimes occurring in the granular form. It is readily distinguished from the common hornblende, which is usually dark green or black in color.

PAR'GO. A fish, a snapper of the genus *Neomamis*. The familiar red snapper is "pargo colorado," called in Havana markets "pargo guachinango," or Mexican snapper, because brought from the Mexican coast. The silk snapper is "pargo de lo alto."

PARHELIA. See **HALO**.

PARIA, pār'ri-ā, GULF OF. An inlet of the Atlantic Ocean on the coast of Venezuela (Map: Venezuela, E 1). It is 40 miles wide and 100 miles long and almost completely landlocked, being cut off from the Caribbean Sea by the

narrow and rocky Paria Peninsula, while across its mouth lies the island of Trinidad. The gulf communicates with the ocean on either side of the island by the straits known as the Dragon's Mouth in the north and the Serpent's Mouth in the south, each about 10 miles wide. They were thus named by Columbus, who discovered them in 1498, because of the difficulties he found in navigating the strong currents which race through them. The gulf receives the northern arms of the Orinoco delta.

PARIAH, pār'ri-ā (from Tamil *pariah*, *pariar*, drummer; from *parai*, drum: so called because they are hereditary drum beaters). The name applied to aboriginal individuals of low class throughout southern India, who do not belong to any of the castes of the Brahmanical system. They are shunned even by the lowest Hindus who profess Brahmanism, since the touch of a pariah renders a Brahman impure. Pariahs were formerly compelled to wear a bell to warn Brahmans of their proximity. The pariahs are of Negrito origin, as shown by their short woolly hair, flat nose, thick lips, and short stature. They, like the Hindus, are divided into distinct grades and imitate their superiors in that the lowest pariah is as careful to preserve his status as the proudest Brahman. In the Tamil country they form a large part of the population and are employed as agricultural laborers or as servants to Europeans. In station, however, they are superior to other aborigines. Consult Louis Lapicque, "Le problème anthropologique des Parias et des castes homologues chez les Dravidiens," in *Bulletin de la Société d'Anthropologie de Paris*, vol. vi (Paris, 1905), and Gustav Oppert, "Ueber die indischen Parias," in *Archiv für Anthropologie*, vol. xxxii (Brunswick, 1906).

PARIAH DOG. The native cur of Egypt, Persia, and all Oriental countries, regarded merely as an outcast and a scavenger. According to Youatt, there are several varieties, viz., (1) a wild form bred in the jungles and lower ranges of the Himalaya, of a reddish-brown color, with sharp pointed ears; (2) a form in inhabited districts among which turnspits are often found; (3) the Sumatran form, which has the countenance of a fox, eyes oblique, ears rounded and hairy, muzzle foxy brown, tail bushy and pendulous; (4) the Javanese indigenous dog. Stonehenge describes the pariah dog as a cross between a dhole and any domesticated dog of the neighborhood, and Fitzinger calls it a variant of the sheep dog. The pariah dogs of Egypt appear to belong to a single race and, according to Lydekker, are about the size of a sheep dog, but of a stouter build, with a broader head, the tail being long, generally bushy, and carried close to the ground. The general color of their coarse rough hair is reddish brown, tending in some individuals more decidedly to gray and in others to yellow. Occasionally black or tawny individuals may be observed. Their ears are short, pointed, and usually erect.

PARIAN. A composition of porcelain glays used for ceramic statuettes. It is called Parian from its resemblance in lustrous transparency to marble (q.v.). In this respect it is superior to biscuit (q.v.), a more opaque porcelain used for the same purpose. Parian was invented by a Mr. Battam, and was first produced in the Copeland manufactories.

PARIAN CHRONICLE. A marble slab

containing the most important inscription among the Arundel Marbles (q.v.).

PARIETAL BONES. See SKULL.

PARIEU, pá'ryé', MARIE LOUIS PIERRE FÉLIX ESQUIRON DE (1815-93). A French politician and economist, born at Aurillac. He studied at Paris and Strassburg and practiced law at Rouen. In 1848 he was elected to the Constituent Assembly, where he voted with the Moderate Left. From 1849 till 1851 he was Minister of Public Instruction. He joined the Bonapartist party, and became a member of the Council of State in 1852. In the ministry of Ollivier he was President of the Council of State. He served as Senator from Cantal in 1876, but was defeated in the election of 1885. He was one of the most earnest advocates of a single gold standard in France. His chief works are: *Traité des impôts* (1862-64); *Principes de la science politique* (1870); *La politique monétaire en France et en Allemagne* (1872); *Histoire de Gustave-Adolphe* (1875).

PARIGOT, pá'régó', HIPPOLYTE (1861-). A French literary critic, born at Troyes and educated at the lycées of Troyes and Louis le Grand, and at the Ecole Normale Supérieure. Gaining the degree of doctor of letters in 1898, he afterward taught at various lycées, finally becoming professor of rhetoric at the Lycée Condorcet. He was made Knight of the Legion of Honor. His writings, mostly on nineteenth-century literature and especially the drama, comprise: *Emile Augier* (1892; 6th ed., 1900); *Diderot* (1893); *Le théâtre d'hier* (1893), crowned by the French Academy; *Génie et métier* (1894); *L'imitation dans la poétique d'Aristote* (1898); *Le drame d'Alexandre Dumas* (1899), crowned by the Academy; *Stendhal* (1901); *Alexandre Dumas, père* (1902); *Renan et l'égoïsme intellectuel* (1909). His later work was contributed largely to *La Revue de Paris* and *La Revue Bleue*.

PARILIA. See PALILIA.

PARILLA (pá-ril'á) **YELLOW.** See MOON-SEED.

PARIMA, pá-ré'ma, SIERRA DE. An isolated mountain system running along part of the boundary of Venezuela and Brazil, with a chain extending into Venezuela, and forming part of the divide between the Orinoco and the Amazon (Map: Brazil, E 3). Though the name Parima is commonly extended to the whole system, the eastern range is also known as the Sierra Pacaraima. It forms a vast turtle-back plateau consisting of a granite core underlying Old Sandstone strata. This plateau is crossed in various directions by short ridges, and falls, especially towards the Amazon valley, by several steep escarpments. The higher ridges are generally barren rocks, but the plains intervening between the successive escarpments are covered with grass or forests. The system is neither so high nor so sharply defined as the northern mountains of Venezuela. The highest points are Mount Maraguaca, 8230 feet, and Mount Duida, 8120 feet. The latter is a conspicuous landmark, situated near the point of bifurcation of the Orinoco and the Cassiquaire.

PARINI, pá-ré'né, GIUSEPPE (1729-99). An Italian poet, born at Bosio, May 23, 1729. Forced by circumstances to become a priest, he took orders in 1754 and became preceptor in the Serbelloni family, Milan. After the appearance of his first verses he was made a member of the Accademia dei Trasformati, and

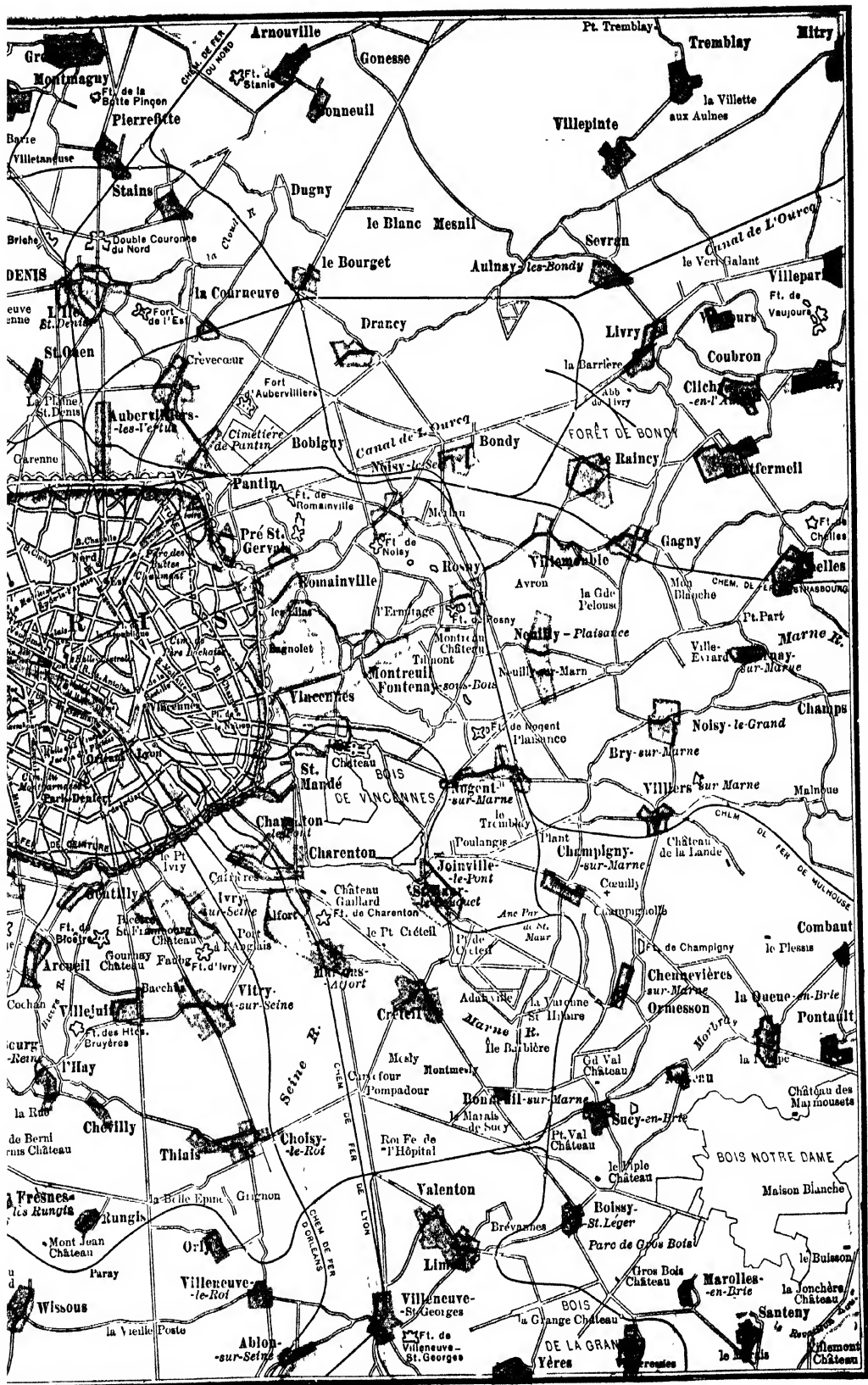
he was admitted into a branch of the Arcadia. From 1773 on he taught the principles of fine arts at the Brera in Milan. Bonaparte, whose appearance on Italian soil made him hope much for Italy, gave him an office in the city government, but Parini could not conceal his disapproval of the consular unscrupulousness, and after three years his services were dispensed with. His criticism of society found its most complete expression in the *Giorno*, written after 1760, one of the most important literary productions of Italy in the eighteenth century. A trenchant satire of vicious conditions, it is admirable for beauty of verse as well as for faith in the fundamental soundness of family, country, and humanity.

In the *Odi*, 19 in number and written between 1757 and 1795, the destructive criticism of the *Giorno* gives place to constructive teaching. He wants to give his fellow citizens a sane conception of life, of duty. As to form, while there is an occasional reminiscence of early Arcadian influence, there is a vigor and nobility of language, and a clearness of conception, which strike a new note in lyric poetry. Consult Reina's edition of the *Opere di Giuseppe Parini* (Milan, 1801-04), which is still the most nearly complete collection of his works and contains his prose productions (mainly academic discourses) as well as his verse, reproduced by M. Scherillo, *Poesie scelte e illustrate di Giuseppe Parini* (Milan, 1900), and by G. Natali, *Poesie di Giuseppe Parini* (Milan, 1905); also Bertoldi's *De Odi di Giuseppe Parini* (Florence, 1911). Of the *Odi* the best edition is that of Salveraglio (Bologna, 1882). Consult also Cerquetti, *Il testo più sicuro delle Odi di Giuseppe Parini* (Osimo, 1892).

PARIS, pá'rís, *Fr. pron.* pá'ré'. The capital of France, the third largest city of the world, situated on both banks of the river Seine, 233 miles, or 110 miles in a direct line, from its mouth, lat. 48° 50' N., long. 2° 20' E. The city consists of 20 arrondissements; these together with the suburban arrondissements of Saint-Denis and Sceaux form the Department of Seine (q.v.) (Map: France, N., H 4). Paris is encircled by a wall about 21½ miles long. Within this circuit the 20 arrondissements (6 on the left and 14 on the right bank of the Seine) have an area of 7802 hectares (about 30.1 square miles, or 19,279 acres). The city lies in a hollow, about 200 feet above the level of the sea, and is surrounded by low hills, which to the north, at Belleville and Montmartre, reach a maximum altitude respectively of 330 feet and 420 feet. These hills, separated by narrow valleys or plateaus, as those of Saint-Denis to the north, Ivry to the southeast, Montrouge to the south, and Grenelle to the southwest, are encircled at a distance of from 2 to 5 miles by an outer range of heights, mostly fortified, which include Mont Valérien, 450 feet above the Seine, the highest point in the immediate vicinity of the city, Villejuif, Meudon, and Saint-Cloud. The hollow is a small level plain of Tertiary formation, known as the Paris basin, composed at varying depths of different strata of gypsum and marls abounding in fossil remains, siliceous limestones, and a vast chalk bed. The strata provide in part the city's building material, stone, gravel, etc. The climate is fairly uniform and mild, pleasant and healthful, the mean annual temperature being about 50° F., the mean January temperature 36°, July 65°. The river seldom freezes. Rain falls on an aver-

[illegible]

A detailed black and white map of Paris and its vicinity. The map shows the city of Paris in the center, with its characteristic circular layout and numerous districts labeled. Surrounding Paris are various towns and villages, including Versailles to the west, St. Germain to the northwest, and Boulogne to the north. The map also shows the Seine River and other water bodies. A scale of miles and kilometers is provided in the top left corner. The map is titled "PARIS AND VICINITY" and includes a scale of miles and kilometers. The map is a historical or reference map, showing the city's layout and surrounding areas in detail. The map is a black and white print, with labels for numerous locations and features. The map is a detailed representation of the Paris region, showing the city's layout and its relationship to the surrounding landscape. The map is a valuable resource for understanding the geography and history of Paris and its vicinity. The map is a detailed and accurate representation of the Paris region, showing the city's layout and its relationship to the surrounding landscape. The map is a valuable resource for understanding the geography and history of Paris and its vicinity. The map is a detailed and accurate representation of the Paris region, showing the city's layout and its relationship to the surrounding landscape. The map is a valuable resource for understanding the geography and history of Paris and its vicinity.



age on about 200 days in a year, the average quantity during that period being about 20 inches.

The encircling wall of the city is fortified by 94 bastions, pierced by 57 gates, and having a glacis and moat 48 feet wide. In addition there are 17 detached forts within a distance of 2 miles and 19 outlying fortresses encircling an area of 400 square miles. The modern enceinte was constructed by Louis Philippe in 1841-44, but the outlying fortresses were added after the War of 1870. The city has been regarded as the greatest fortress in the world.

Steam and electric railroads give access to the numerous suburbs famous alike for their picturesque situations and historical associations. These include the more immediate suburbs of Boulogne, with the famous Bois de Boulogne (bordering Paris on the west), adjoining which is the race course of Longchamps, Neuilly, Levallois-Perret, Clichy-la-Gareigne, Suresnes, Puteaux, Courbevoie, Asnières, Aubervilliers, Bobigny, Pantin, Pré-Saint-Gervais, Vincennes, with its wood, fort, château, and race course, Charenton, Ivry, Gentilly, Arcueil, Bagneux, Chatillon, Montrouge, Vanves, Issy, Meudon, and the more distant Versailles with its palace, gardens, fountains, art collections, and the Grand and the Petit Trianon; Rambouillet, with its castle, parks, and gardens; Saint-Cloud, with its palace and park; Saint-Germain-en-Laye, with its two castles; Sèvres, famous for its porcelain factories; Saint-Denis, with its abbey cathedral, where the kings of France are buried; Enghien, noted for its sulphur springs, on a wooded lake near the forest of Montmorency; Argenteuil, a favorite boating resort; Mériel, which derives its celebrity from the neighboring Abbaye du Val, a twelfth-century monastic edifice of great archaeological interest; Dampierre, with the splendid ducal château of the Luynes family; Fontainebleau, with its palace, fine-art collections, and its extensive forest with Barbizon, the resort of artists, on the western border; Malmaison, with the former château of the Empress Josephine; and Marly-le-Roi, with its forest and aqueduct.

Communications and Bridges. The wall-girt city is entered by six lines of railway. The palatial stations in the metropolis include the Gare du Nord on the Place Roubaix, the Gare Saint-Lazare, facing the Rue Saint-Lazare, the Gare de l'Est or de Strasbourg on the Place de Strasbourg, the Gare d'Orléans on the Quai d'Austerlitz, and the Gare de Lyon on the Boulevard Diderot. The Seine, which enters Paris in the southeast at Bercy, about a mile below its junction with the Marne, is spanned by 32 bridges. It leaves the city at Point du Jour in the southwest, having divided it in two parts and having formed the two islands of La Cité and Saint-Louis, which are both covered with buildings. The river at Paris is from 300 to 500 feet wide. The most celebrated and ancient of the bridges crossing the river are the Pont Notre-Dame, dating from 1500, and the Pont Neuf, begun in 1578, completed by Henry IV in 1604, and thoroughly restored in 1852. The latter, which crosses the Seine at the lower end of the Ile de la Cité, is 1080 feet long and abuts near the middle on a small peninsula planted with trees which form a background to the equestrian statue of Henry IV, which stands in the central open space on the bridge. Among the other bridges the handsomest include the Pont de la Concorde, 160 yards long, built in

1781-90; the Pont d'Austerlitz (1802-07; widened, 1885); the Pont d'Iéna (1809-13); the Pont du Carrousel, built under Louis Philippe; and the Pont des Invalides, Pont de l'Alma, and Pont de Solférino, all fine structures, adorned with military and naval trophies commemorative of events and victories connected with the Second Empire. Among the most recent and one of the most striking is the Pont Alexandre III (1896-1900), named in honor of the Czar, and the Pont Mirabeau, connecting Auteuil and Grenelle. These bridges all communicate directly with the spacious quays, planted with trees, which line both banks of the Seine and which, together with the boulevards, give characteristic beauty to the city. Although the most ancient quays, as the Quai des Augustins and the Quai de la Mégisserie, date from the fourteenth century, the greatest part of these magnificent embankments, measuring 12 miles in extent, is due to Napoleon I and Napoleon III.

Streets, Buildings, Monuments, etc. The private houses, most of which are of the apartment or flat-house order, rising to six or seven stories, as well as the public buildings, are built of a light-colored limestone, easily wrought and carved ornamentally. Among the finest of the wide and straight streets are the Rue de Rivoli, 2 miles in length, the Rue de la Paix, the Rue du Faubourg-Saint-Honoré, the Rue Royale, and the Avenue de l'Opéra. The boulevards, which extend in an irregularly circular line on both sides of the Seine, generally on the site of the ancient ramparts, between the nucleus of the city and its surrounding quarters, present the most striking feature of Parisian life. In all the better parts of the city they are lined with trees, seats, and little towers, called *vespasiennes*, covered with advertisements. Restaurants, cafés, shops, and various places of amusement succeed one another for miles, their character varying from the height of luxury and elegance in the Boulevard des Italiens and the Boulevard Haussmann, to the domestic simplicity of the Boulevards Beaumarchais and Saint-Denis. Among the public squares or places, of which there are over 130, mostly owned by the municipality, the most noteworthy is the Place de la Concorde, which connects the gardens of the Tuileries (q.v.) with the Champs Elysées (q.v.) and embraces a magnificent view of some of the finest buildings and gardens of Paris. In the centre is the famous obelisk of Luxor, brought from Egypt to France in 1836 and covered over its entire height of 76 feet with hieroglyphics. On the site of this obelisk stood the Revolutionary guillotine, at which perished Louis XVI, Marie Antoinette, Philippe Egalité, Danton, Robespierre, and a host of others. Two magnificent bronze fountains by Hiltorf and eight allegorical statues representing eight former capitals of provinces, including Strassburg, are among the other embellishments of this square, which is one of the finest in Europe. Of the other squares the following are some of the handsomest: the Place du Carrousel, west of the Louvre, with the Arc de Triomphe du Carrousel, erected by Napoleon I in commemoration of his victories in the campaigns of 1805-06; the Place de la République, with a fine bronze statue of the Republic; the Place de l'Opéra; the Place Vendôme, with Napoleon's column of victory; the Place de la Bastille, where once stood that famous prison and fortress (see BASTILLE); the Place de la Nation, formerly Place du Trône (with its fine

fountain and monumental group, the Triumph of the Republic); the Place de l'Hôtel de Ville, formerly Place de la Grève, for ages the scene of public executions and the spot at which some of the bloodiest deeds of the Revolution were perpetrated. The Porte Saint-Martin and the Porte Saint-Denis, which were erected by Louis XIV to commemorate his victories in the Low Countries, and are adorned with bas-reliefs representing events of these campaigns, mark the ancient limits of the most turbulent quarters of the Paris of the past; the Arc de Triomphe de l'Etoile, 160 feet high and 146 feet wide, begun by Napoleon I in 1806 and completed in 1836 at a cost of more than \$2,000,000, may be said to form the extreme western boundary of the aristocratic quarters. It is profusely adorned with bas-reliefs representing victories of Napoleon and with four colossal allegorical groups representing the Departure, War, Victory, and Peace. The great streets which radiate from the Arc de Triomphe de l'Etoile are among the most magnificent of Paris and form the finest quarter. The Place de l'Etoile is connected with the Champs Elysées by the Avenue des Champs Elysées, with the celebrated Bois de Boulogne (q.v.) by the Avenues Grande Armée, Bois de Boulogne, and Victor Hugo and the Portes Neuilly, Dauphiné, and Maillot; and it communicates by the Avenues Kléber and d'Iéna with the Place, the Parc, and the Palais du Trocadéro.

The Palais du Trocadéro, named after a Cadiz fort taken in 1823 by the French, dates from the Exhibition of 1878; it is a mammoth building of Oriental architecture and crescent form, on an elevation above a huge ornamental cascade. It has valuable museums of comparative sculpture and of ethnography, and its fine Salle des Fêtes, containing a huge organ, can accommodate 6000 persons. In the well-kept park is a subterranean aquarium. The Pont d'Iéna leads from the Parc across the Seine to the historic Champ de Mars (q.v.), the site of the universal expositions since 1867 and of the Eiffel Tower (q.v.), 984 feet high, built for the Exposition of 1889. On the southeast is the Ecole Militaire, founded in 1752 and formerly used as barracks for infantry and cavalry, but now occupied by the Ecole Supérieure de Guerre. Near by is the Hôtel des Invalides (q.v.), founded in 1670 for disabled soldiers. The crypt of the church contains the sarcophagus, hewn from a huge block of Russian granite, in which lie the remains of Napoleon I, deposited there in 1861. The Musée d'Artillerie in the west wing comprises an historical collection of 10,000 war implements. The fine Esplanade des Invalides, fronting the building and bordered by the Quai d'Orsay, connects by the Pont Alexandre III with the Champs Elysées on the north bank. Here are situated the Palais de l'Elysée (1718), the official residence of the President of the Republic, the Grand and the Petit Palais des Beaux-Arts, where the Salons are held, and the Palais de Glace, the three latter built for the Exposition of 1900, having replaced the Palais de l'Industrie built for the first Great Exposition in 1855 and until 1897 serving for the annual exhibitions of the Salon. Thence through the Place de la Concorde the Jardin des Tuileries is reached, to the east of which is the Louvre (q.v. and Plate), forming a square of 576 by 538 feet, remarkable, especially the eastern façade, for its architectural beauty.

The Louvre, formerly a royal residence, was connected with the celebrated palace of the Tuileries (q.v.) by a great picture gallery, and between the two palaces lay the Place du Carrousel. Napoleon III further connected the Tuileries and the Louvre on the northern side, throwing them into one vast building, which formed the most palatial structure in the world. The Tuileries continued to be occupied as the residence of the Imperial family; but the Louvre proper, with its series of great galleries, formed a vast museum of pictures, sculptures, and collections of Egyptian, Greek, and Roman antiquities. The Communards of 1871 attempted to burn the whole pile and succeeded in destroying the Tuileries and a corner of the Louvre; the ruins of the Tuileries were demolished in 1883, except the rebuilt corner pavilions de Flore and de Massan. The library of the Louvre, with its contents, was burned, but the rest of the building and its priceless treasures were saved. North of the Louvre is the Palais Royal (q.v.), and north of the Palais Royal is the Bourse or Exchange (1808-26; enlarged, 1903), a beautiful structure in Græco-Roman style, surrounded by 66 Corinthian columns, to the east, on the north bank of the Seine, opposite the Île de la Cité, is the Hôtel de Ville. The original structure, erected between 1533 and 1628, was burned by the Communards in 1871; it was rebuilt in 1876-84 in the original Renaissance style, and is one of the most magnificent buildings in Paris. It is the residence of the Prefect of the Seine and includes all the offices for the transaction of the municipal business of Paris. Not far from the Hôtel de Ville is the Tour Saint-Jacques, a square Gothic tower 175 feet high, dating from 1504-22 and until recently utilized as a meteorological observatory, it affords one of the finest views in Paris. Almost opposite, on the northern bank of the Cité, stands the vast Palais de Justice, originally the residence of the kings of France; some parts of it date from the fourteenth century, others are modern. It is the seat of some of the courts of law, as the Court of Cassation and the tribunals of first appeal and of police. Within the precincts of this palace are the fine Gothic Sainte-Chapelle (1245-48) and the noted old prison of the Conciergerie, in which Marie Antoinette, Danton, and Robespierre were successively confined. The Conciergerie, in which prisoners are lodged pending their trial, constituted one of the eight prisons of Paris, of which the principal were La Force, Sainte-Pélagie, Saint-Lazare, Mazas, and La Roquette. The latter were replaced about the end of the nineteenth century by the modern prison of Fresnes-les-Rungis, which covers 50 acres, the Conciergerie alone being retained.

Among other notable features on the north of the river are the mammoth Halles Centrales or Central Markets, the Marché du Temple, and the Parc des Buttes-Chaumont. The palace of the Luxembourg (q.v.), on the south side of the Seine, was built in the Florentine style by Jacques Debrosse for Marie de' Medici. It contains many magnificent rooms, including the handsome chamber in which the Senate meets. In an adjacent building is the Luxembourg Museum, devoted to the works of modern artists. The gardens of the Luxembourg are extensive and of great beauty. Also on the south side of the river are the Sorbonne (q.v.), the centre of the famous Latin Quarter, the Panthéon (q.v.),

the Jardin des Plantes, the large Halle aux Vins, the Hospice de la Salpêtrière, the Observatory, and the cemetery of Mont Parnasse.

Paris has many theatres and places of amusement suited to the tastes and means of every class. The Opéra, Théâtre Français (chiefly devoted to classical French drama), Odéon, and Opéra Comique receive a subvention from the government. The opera house, completed in 1875, is a magnificent building, costing, exclusive of the site, \$5,600,000. It is at present the largest theatre in the world, occupying an area of about 2¾ acres; its auditorium, however, which seats 2500, is surpassed in size by many others in Europe and America. Its most striking features are the magnificent grand staircase and the foyer with admirable decorations. Other notable theatres are the Gymnase, Variétés, Vaudeville, Porte Saint-Martin, and Palais Royal. Cheap concerts, equestrian performances, and public balls, held in the open air in summer, supply a constant round of gayety to the bourgeois and working classes at a moderate cost, and form a characteristic feature of Parisian life.

Among the large number of churches the grandest and most interesting from an historic point of view is the cathedral of Notre-Dame (q.v.), which stands on a site on the Ile de la Cité successively occupied by a pagan temple and a Christian basilica of the time of the Merovingian kings. The present building was constructed between 1163 and 1265; since then it has been but slightly altered, and in its present state of restored magnificence ranks as one of the noblest specimens of Gothic architecture. Saint-Germain-des-Près, which is probably the most ancient church in Paris, was completed in 1163. Of nearly equal antiquity is Saint-Pierre-de-Montmartre. Saint-Etienne-du-Mont (1517-41) and Saint-Germain-l'Auxerrois (thirteenth to sixteenth century) are interesting, the former for its picturesque and quaint decorations and for containing the tomb of St. Genevieve, the patron saint of Paris, and the latter for its rich decorations and the frescoed portal, restored at the wish of Margaret of Valois, and for the fact that from its little bell tower the signal was given for the massacre of the Huguenots on St. Bartholomew's night. The Sainte-Chapelle, built by St. Louis in 1245-48 for the reception of the crown of thorns and other relics which he had brought from the Holy Land, is one of the most remarkable buildings in Paris, profusely decorated in all parts with brilliantly colored materials. In Saint-Eustache, erected 1532-1637, the largest parish church in Paris, interesting artistically as a Gothic structure carried out wholly in early Renaissance style, the Feast of Reason was celebrated in 1793: here is performed probably the finest religious music in Paris. Saint-Sulpice, finished in 1749, is noticeable for its size, measuring 462 feet in length, 183 feet in width, and 108 feet in height. Among modern churches are: the Madeleine (q.v.), built in imitation of a Greek temple and surrounded by a colonnade of 54 massive Corinthian columns—the building having no windows, the light enters through the ceiling of the three cupolas surmounting it and the interior is gorgeous with gildings, frescoes, carvings, marbles, and statues; the Panthéon (q.v.), which was begun as a church, but converted by the Constituent Assembly at the time of the Revolution into a temple dedicated to the great men of the nation,

was restored to the Church by Napoleon III and rededicated to St. Genevieve, but was definitely secularized in 1835, when Victor Hugo was buried there; Notre-Dame-de-Lorette, erected in 1823-36, a flagrant specimen of the meretricious taste of the day; Saint-Vincent-de-Paul, completed in 1844, an imposing monument of the Neo-Greek style; and, crowning the height of Montmartre, the national votive church of the Sacré Cœur, begun in 1875, a Romanesque edifice with five domes and a campanile 263 feet high. Among the Protestant churches L'Oratoire, built in 1645, is the largest and the best known.

Paris has a number of cemeteries, of which the principal one is Père Lachaise, extending over 110 acres and filled in every part with monuments erected to the memory of the multitude of celebrated persons who have been buried here. The Morgue, recently removed from its former site on the Ile de la Cité, is a building in which the bodies of unknown persons who have met with a violent death are placed. These, if not claimed within three days, are buried at the public expense. The southern parts of the city are built over beds of limestone, rich in fossils, which have been so extensively quarried as to form a network of vast caverns, which in some cases scarcely afford sufficient support to the houses above. These quarries were converted into catacombs in 1784, and received the bones of the dead collected from the ancient cemeteries of Paris.

Educational Institutions. The institutions for higher education are situated chiefly in the Quartier Latin. The old Sorbonne (q.v.), a large building erected by Cardinal Richelieu for the faculties of the old University of Paris, has been replaced by a magnificent modern building, with fine lecture halls and classrooms and an extensive library open to the public. Near the Sorbonne is the Collège de France, where gratuitous public lectures are delivered by eminent scholars and men of letters. The Ecole Polytechnique, the School of Medicine and the School of Law, the Observatory, and the Jardin des Plantes, with its great museum of natural history, lecture rooms, and botanical and zoölogical gardens, are situated in the same quarter of Paris. See PARIS, UNIVERSITY OF.

The principal of the public libraries is that of the Rue Richelieu, now called the Bibliothèque Nationale, which contains more than 3,000,000 volumes, 105,000 manuscripts, many portfolios of engravings, and a collection of 400,000 coins and medals, which originated in a small collection of books placed by Louis XI in the Louvre. In addition the municipality maintains many branch libraries. No city is richer than Paris in fine-art collections, and among these the museums at the Louvre stand pre-eminent. The Palais or Ecole des Beaux-Arts, the most noted school of art in the world, dating from 1648, covers a large area entered from the Rue Bonaparte, and comprises ateliers or studios of painting, sculpture, architecture, and engraving, a superb library, and collections of paintings and casts. The Hôtel de Cluny, connected underground with the Roman Palais des Thermes, besides being in itself a most interesting monument of mediæval art, contains curious relics of the arts and usages of the French people from the earlier ages of their history to the Renaissance period. The Mint deserves notice for the perfection of its machinery. The Gobelins, or tapestry manufactory, may be in-

cluded under the fine arts, as the productions of its looms are all manual and demand great artistic skill. The Conservatoire des Arts et Métiers, in the Rue Saint-Martin, contains a great collection of models of machinery and classrooms for the instruction of workmen in all departments of applied science. The Palais du Trocadéro is an imposing building, originally erected for concerts and exhibitions in connection with the Exhibition of 1878. Its extensive wings house a permanent collection of casts (see MUSÉE), which now forms a permanent exhibition. Among the numerous learned societies, associations, and institutions the chief are the Académie de Médecine and the Institut de France, the latter housed in the Palais de l'Institut on the Seine at the end of the Pont des Arts. See INSTITUTE OF FRANCE.

Administration. Paris is divided into 20 arrondissements for purposes of administration. The Prefect of the Seine is the chief of the municipal government and is appointed by the national government. There is a municipal council, composed of 80 members, four from each arrondissement, chosen by popular election. Each arrondissement has a mayor and three assistants, all appointed by the President. The arrondissement is the unit of municipal organization for all administrative purposes. It registers all the births and deaths within its boundaries; keeps the registration lists of voters and jurors; attends to the assessment and collection of all taxes; receives application for licenses and privileges; serves as an agency in floating municipal or state loans; administers the schools and libraries; and forms the local centre for all modes of charity work. The whole work of the municipal administrative machine is greatly facilitated by the admirable system of civil service regulating all the appointments and promotions of city officials. The prefect of police is at the head of the civic guard or *gendarmes*, the fire brigade, and the *gardiens de la paix*, or city police, who are armed with swords.

Paris has an abundant water supply, which comprises a supply for domestic purposes and a separate supply for industrial purposes, street cleaning, etc. The chief sources are the Seine, the Canal d'Ourcq, the Marne, the Dhuis, and a vast natural reservoir underlying the Paris basin; the latter is tapped by artesian wells, the most famous of which is the well of Grenelle, 1800 feet deep and surmounted by a tower 108 feet high. The cleaning, sewerage, and water supplies are under the charge of the prefect. The sewerage system is admirable; the total length of the underground channels is over 646 miles, and they are kept so clean and well ventilated that an hour's excursion through the sewers or *égouts* is one of the ordinary experiences of visitors to Paris, the journey being made partly in boats and partly by electric trolleys. Paris has a sewage farm, 5 miles from the city limits (in the Saint-Germain Forest), which has proved a success agriculturally without in the least injuring the health of the community in that region. The paving of the city leaves nothing to be desired, and the street lighting is admirably carried out by means of electric and gas lights furnished by private companies, as explained below.

The administrative tendency in Paris is for municipal ownership of all works supplying public wants and directly affecting public health.

The Conseil d'Hygiène et de Salubrité, or

Board of Health, is composed of men known for their high attainments in science, and includes physicians, city engineers, and men whose technical training enables them best to deal with sanitary problems. Within the scope of its work come not only cases of disease and epidemics, but also the sanitary regulation of workshops, schools, and dwellings, prevention of adulteration of food; sanitary aspects of the water supply; drainage; and cemetery management. In addition to that central body there are 20 commissions d'hygiène, one for each arrondissement, and a commission des logements insalubres, composed of physicians, architects, and engineers, whose duty it is to pass upon the sanitary conditions of dwellings; they can recommend sanitary improvements or condemnation of houses, and their recommendations are as a rule favorably acted upon by the municipal council. There is a special service of sanitary police which enforces all the health laws.

In addition to the activities enumerated above the municipality owns all markets, cattle yards, and slaughterhouses, from which it derives a considerable income. The municipal markets and abattoirs facilitate the inspection of the meat supply, and the municipal laboratory has done a great deal in checking adulteration of milk, bread, wine, and other food of common use, and has served greatly to reduce the death rate.

The poor relief is organized in Paris on a large scale and centralized in the hands of a special department called L'Assistance Publique à Paris. This has charge of the hospitals, of the homes and asylums for aged poor as well as for friendless children, and of outdoor relief. The department is under the authority of the prefect and is governed by a director and a board composed of leading men from various government departments. The work is carried out in detail by the bureaux de bienfaisance, one in each arrondissement, which are composed of persons familiar with the people in their respective districts. The city comes to the aid of the poor in several other ways. There are a number of municipal lodging houses open to unemployed workmen free of charge and furnishing a meal to each guest. A similar home exists for working women. From 15,000 to 20,000 families are helped each year by advance of rent money in cases of threatened eviction. An agricultural colony has been established not far from the city for those unable to make a living. A free employment office is maintained by the city in each arrondissement, and a central labor exchange known as the Bourse du Travail was erected by the municipality in 1892 at a cost of 2,000,000 francs. In addition the municipal council votes 50,000 francs annually for the maintenance of the institution, which serves as the headquarters of all the trade-unions in the city. A public pawnshop (Mont-de-Piété) has been in existence for more than a century. It advances loans in any amount at 6 per cent, which is a great accommodation for the poor. The largest of the numerous hospitals or almshouses is La Salpêtrière (for women), probably the largest asylum in the world, extending over 78 acres of land; 1300 of its 4500 inmates are insane. Bicêtre, with nearly 3600 beds, receives only men. The Hospice des Enfants Trouvés, or foundling hospital, provides for the infants brought to it till they reach the age of maturity, and demands payment only in the event of a

child being reclaimed. The crèches, or public nurseries, first established in 1844, of which there are now 18, receive the infants of poor women for the day at the cost of 20 centimes. Besides institutions for the blind, deaf and dumb, convalescents, sick children, etc., Paris has 17 general and special hospitals. Of these the oldest and most noted are the Hôtel Dieu, La Charité, and La Pitié.

Education. The educational facilities of Paris are very complete. A system of kindergartens called Ecoles Maternelles is provided for children between the ages of 3 and 7, and although attendance there is not compulsory, they are all patronized, as they are a great help to the poor. The attendance is very close to 70,000. Next follow the Ecoles Infantines, which are a transition from the kindergarten to the primary school and are open to children between 6 and 8. The primary schools for children below the age of 14 employ nearly 3000 teachers, half of them men and half women, and are attended by 170,000 pupils. The school system is under the joint supervision of the municipal council, the prefectural administration, and the national Ministry of Education. The children are supplied with textbooks, etc., and those unable to pay (60 per cent of the total number) are given gratis one meal each day. A new feature of the school system is the boarding school for children of widowers or guardians unable to give proper care to their children. The cost of boarding and clothing a child has been fixed at 600 francs a year, but since 1892 the payment has been reduced to 120 francs for those unable to pay more, the city paying the remainder. Upon the completion of the primary school a child is free to enter either a high school or a professional school.

Finance. The maintenance of so many institutions involves, naturally, a great annual expense, and their municipalization has required the contraction of large loans. The budget of Paris for 1911 showed revenue of 380,930,325 francs and expenditure of 378,809,580 francs. The larger estimated disbursements were municipal debt, 127,600,000 francs, charity and health, 63,500,000; police, 42,300,000, education, 28,500,000, streets, 25,000,000. The municipal debt at the beginning of 1911 stood at 2,724,000,000 francs. Taxes in 1911 amounted to about 116,800,000 francs. There are several sources of income from the various companies holding franchises. Paris does not own its water works nor the gas and electric plants, and has no municipal transit system. The gas company, in addition to furnishing gas for the illumination of the streets and public buildings at cost price, pays 200,000 francs a year for the right to lay its pipes and a tax of 2 francs for every 100 cubic meters of gas it sells, and divides with the city all its profits above 13½ per cent on its capital stock, which it is not allowed to increase. There are similar arrangements with water and electric-lighting companies and markets, abattoirs, and cemeteries. Revenue from gas companies in 1911 amounted to 24,300,000 francs, and from water companies to 26,500,000 francs.

Transportation. The main means of intra-mural communication is supplied by the omnibuses and electric tramways, the latter are in a great measure supplanting the former. Motor omnibuses have been in use since 1906. The comprehensive system of electric municipal

tramways, in large part underground and not yet completed, had in 1911 a length of 48½ miles. One of the lines supplements the old surface steam belt railway that passes around the city just inside the fortifications. The cab service in Paris is unexcelled, motor cabs are numerous. The steamboats on the Seine are well patronized in pleasant weather.

Industry and Trade. Paris is the largest industrial centre of France. It has a world-wide renown for the elegance and taste of its products. There are comparatively few large industrial undertakings, Paris being more of a centre of small workshops employing highly skilled labor. Of late, however, a tendency has been noticed towards large establishments. Large factories are found in such industries as the manufacture of machinery, railroad supplies, chemical products, soap, dyes, beer, china, porcelain, leather, etc. Small workshops, however, predominate in the production of clothing, gold and silver articles, furniture, optical and surgical instruments, toys, paper boxes, steel and aluminum articles, artificial flowers, perfumes, articles of luxury, gloves, etc. In all these products Paris excels the world. The book-publishing business of France is almost wholly concentrated in Paris. As a trading centre Paris stands at the head of the list of French cities. The products of its industry, most of which are exported, are valued at more than 3,000,000,000 francs annually. It was among the first cities of the world to introduce large department stores such as the Louvre, the Bon Marché, and Printemps. The most important financial institutions are the Banque de France, the Crédit Foncier, the Crédit Lyonnais with 22 branches in the city, and the Clearing House, called Chambre de Compensation de Banquiers. And there is the Bourse de Commerce in addition to the Bourse de Travail.

Population. The population of Paris varied little from the thirteenth to the sixteenth century, ranging during that period from about 200,000 to about 260,000. In 1637 the number of inhabitants was about 415,000, in 1680, 500,000, in 1718, 509,000, in 1801 (the first census), 547,756, in 1817, 713,966, in 1831, 785,862, in 1851, 1,053,262, in 1861 (after the annexation of several suburbs), 1,696,141, in 1872, 1,851,792, in 1881, 2,269,023, in 1891, 2,447,957, in 1901, 2,714,068, in 1906, 2,763,393, in 1911, 2,888,110. In 1911 the density of population was 149.9 per acre, in 1911 the density in the administrative County of London (with an area of 74,816 acres and a population of 4,521,685) was 60.4 per acre. The most densely populated arrondissement is the third (Temple), which in 1906 had 300 persons to the acre, next in order were the eleventh (Popincourt), 260, the second (Bourse), 253, the ninth (Opéra), 226, the least densely populated was the sixteenth (Passy), with 75 per acre. Nearly 8 per cent of the inhabitants are foreigners, and only about 38 per cent were born in the Department of Seine. In respect of religion the people are predominantly Roman Catholic, there are about 90,000 Protestants and 50,000 Jews.

History. The earliest notice of Paris occurs in Julius Caesar's *Commentaries*, in which it is described, under the name of Lutetia, as a collection of mud huts, composing the chief settlement of the Parisii, a Gallic tribe conquered by the Romans. The ruins of the Palatium Thermarum (Palais des Thermes) and of ancient altars,

aqueducts, and other buildings show that in Roman times the town extended to both banks of the Seine. Christianity was introduced about 250 A.D. by St. Denis. In the fourth century Lutetia began to be known as Parisii, or Paris. In the sixth century Paris was chosen by Clovis as the seat of government, and after having fallen into decay under the Carolingian kings, in whose time it suffered severely from frequent invasions of the Northmen, it finally became in the tenth century the residence of Hugh Capet, the founder of the Capetian dynasty, and the capital of the French monarchy. From this period Paris continued rapidly to increase, and in two centuries it is said to have doubled in size and population. In the Middle Ages Paris was divided into three distinct parts—La Cité, on the islands; the Ville, on the right bank; and the Quartier Latin, or University, on the left bank of the river. Louis XI did much to enlarge Paris and to efface the disastrous results of its hostile occupation by the English during the wars under Henry V and Henry VI of England. Its progress was again checked during the wars of the last of the Valois, when the city sustained several sieges. On the accession of Henry of Navarre in 1589 a new era was opened for Paris. The improvements commenced under his reign were continued during the minority of his son, Louis XIII. Louis XIV converted the old ramparts into public walks or boulevards, organized a regular system of police, established drainage and sewerage works, founded hospitals, almshouses, public schools, scientific societies, and a library, and thus gave to Paris a claim to be regarded as the focus of European civilization. The terrible days of the Revolution (see FRENCH REVOLUTION) caused a temporary reaction. The improvement of Paris was commenced on a new and grander scale under the first Napoleon, when new quays, bridges, markets, streets, squares, and public gardens were created. All the treasures of art and science which conquest placed in his power were applied to the embellishment of Paris, in the restoration of which he spent more than \$10,000,000 in 12 years. His downfall again arrested progress, and in many respects Paris fell behind other European cities.

Renovation of various sorts was recommenced under Louis Philippe, under whom fortifications on a colossal scale were constructed, but it was reserved for Napoleon III to render Paris the most commodious, splendid, and beautiful of modern cities. When he commenced his improvements Paris still consisted, in the main, of a labyrinth of narrow, dark, and ill-ventilated streets. With the assistance of Baron Haussmann, the Prefect of the Seine, his schemes were carried out with rare energy and good taste. Two straight and wide thoroughfares, parallel to and near each other, were made to traverse the whole width of Paris from north to south, crossing the Cité; a still greater thoroughfare was made to run the whole length of the town, north of the Seine, from east to west. The old boulevards were completed so as to form outer and inner circles of spacious streets, the former chiefly lying along the outskirts of the old city, the latter passing through and connecting a long line of distant suburbs. In the year 1867, when the international exhibition was opened, Paris had become in all respects the most splendid city in Europe, and in that year it was visited by upward of 1,500,000 foreigners. Many further improvements were contemplated, but finan-

cial and political difficulties supervened (see FRANCE), and these great schemes had to be postponed. The siege of Paris by the Germans, which lasted from Sept. 19, 1870, to Jan. 28, 1871, caused much less injury to the city than the vandalism of the Red Republicans, who rose against the government in March, 1871, took possession of Paris, and proclaimed the Commune (q.v.) the only lawful government. Acts of pillage and wanton destruction followed. The column erected to the memory of Napoleon and the Great Army in the Place Vendôme, one of the principal squares of Paris, was pulled down as "a monument of tyranny." When the government troops under Marshal MacMahon pressed forward into the city, in the latter part of May, the Communards began systematically to set fire with petroleum to a great number of the chief buildings of Paris, public and private. The fire for a time threatened to destroy the whole city. It was not checked until property had been lost to the value of many millions of dollars and historical monuments were destroyed which never can be replaced. Two years later, however, all the private houses burned had been rebuilt, the monuments only partially injured had been restored, and the streets and public places were as splendid and gay as in the best days of the Empire. The Universal Expositions of 1878, 1889, and 1900 are among the chief events of subsequent history. Paris was the objective of the first German campaign in the European War which broke out in 1914. The Germans were halted by the battle of the Marne when only 30 miles from the city. Several times Paris was bombarded by German air craft. See WAR IN EUROPE.

Bibliography. General description: A. L. A. Franklin, *Les anciens plans de Paris: notices historiques et topographiques* (Paris, 1880); Brander Matthews, *The Theatres of Paris* (New York, 1880); Block and Pontich, *Administration de la ville de Paris* (Paris, 1884); Colin, *Paris sa topographie, son hygiène, ses maladies* (ib., 1885); F. Lacombe, *Bibliographie parisienne* (ib., 1886); Bournon, *Paris, histoire, monuments, administration* (ib., 1887); Piton, *Comment Paris s'est transformé: histoire, topographie* (Paris, 1891); Edmondo De Amicis, *Studies of Paris*, translated by W. W. Cady (3d ed., New York, 1892); S. S. Beale, *The Churches of Paris from Clovis to Charles X* (London, 1893); Maxime Du Camp, *Paris: ses organes, ses fonctions, et sa vie* (8th ed., Paris, 1893); A. J. C. Hare, *Days near Paris* (New York, 1896); G. Riat, *Paris: eine Geschichte seiner Kunstdenkmäler* (Leipzig, 1900); Rolfo, *Plan pittoresque de la ville de Paris* (Paris, 1900); P. G. Hamerton, *Paris in Old and Present Times* (Boston, 1900); *Encyclopédie municipale de la ville de Paris* (Paris, 1902); Hilaire Belloc, *Paris* (London, 1902); Thomas Okey, *Story of Paris*, in "Medieval Towns Series" (New York, 1906); Frank Hamel, *Famous French Salons* (ib., 1908); H. C. Shelley, *Old Paris: Its Social, Historical, and Literary Associations* (Boston, 1912); E. V. Lucas, *A Wanderer in Paris* (new ed., New York, 1913); Roger Boutel de Monvel, *Eminent English Men and Women in Paris*, English translation by G. Herring (ib., 1913), crowned by the French Academy; R. H. Sherard, *Modern Paris* (London, 1914); *Annuaire statistique de la ville de Paris*; also the guidebooks of Joanne, Baedeker, Julius Meyer, Grieben, and Murray.

History: *Histoire générale de la ville de Paris*, published by the municipality (Paris, 1866 et seq.); Dulaure, *Histoire physique, civile et morale de Paris* (7th ed., supplemented by Leynadier, ib., 1862, and by Rouquette, ib., 1875 et seq.); Berty, *Topographie historique du vieux Paris* (ib., 1866-87); W. P. Pettridge, *Rise and Fall of the Paris Commune in 1871* (New York, 1871); Morin, *Histoire critique de la commune* (Paris, 1871); F. Sarcey, *Paris Pending the Siege*, English translation (London, 1871); E. E. Viollet-le-Duc, *Mémoire sur la défense de Paris* (Paris, 1872); Vidieu, *Histoire de la commune de Paris en 1871* (ib., 1880); J. Lebeuf, *Histoire de la ville et de tout le diocèse de Paris*, edited by H. Cocheris (6 vols., ib., 1883-90); Ménorval, *Paris depuis ses origines jusqu'à nos jours* (ib., 1889-97); E. de la Gournerie, *Histoire de Paris et de ses monuments* (8th ed., Tours, 1890); Tourneux, *Bibliographie de l'histoire de Paris pendant la révolution française* (4 vols., Paris, 1890-1906); Lendtre, *Les quartiers de Paris pendant la révolution, 1780-1804* (ib., 1896); Maxime Du Camp, *Les convulsions de Paris* (8th ed., 4 vols., ib., 1897-99); Lehautcourt, *Le siège de Paris* (ib., 1898); P. O. Lissagaray, *History of the Commune of 1871*, English translation by E. M. Aveling (2d ed., New York, 1898); B. E. and C. M. Martin, *The Stones of Paris in History and Letters* (2 vols., ib., 1899); William Walton, *Paris from the Earliest Period to the Present Day* (10 vols., Philadelphia, 1902); Simond, *Paris de 1800 à 1900* (Paris, 1902); Ulysse Chevalier, "List of Works on Mediæval History," in his *Répertoire des sources historiques* (Montbéliard, 1903); Hessling, *Old Paris: Its Historical Buildings* (New York, 1905); L. Lanzaac de Laborie, *Paris sous Napoléon* (Paris, 1906); C. P. B. Rambuteau, *Memoirs* (New York, 1908); M. S. C. Smith, *Twenty Centuries of Paris* (ib., 1913).

PARIS. A town in Brant Co., Ontario, Canada, on the Grand River, and on the Grand Trunk, Lake Erie, and Northern, and the Grand Valley Electric railways (Map: Ontario, E 6). The town has a public library. Its manufactured products include alabastine, flour, woolen cloth, knit goods, bricks, and agricultural implements. Gypsum and brick clay are found in the vicinity. The town owns its electric lighting and water works. Pop., 1901, 3229; 1911, 4098.

PARIS. A city and the county seat of Edgar Co., Ill., 19 miles northwest of Terre Haute, Ind., on the Cleveland, Cincinnati, Chicago, and St. Louis and the Vandalia railroads (Map: Illinois, J 6). It is mainly a residential place and has a children's home, Carnegie library, and a public park of 100 acres, 70 of which are now submerged, forming an artificial lake. The city is in a farming district, the products of which form the staples of a considerable trade. There are extensive manufactures of brooms and a large interurban car factory. The commission form of government was adopted in 1915. The municipality owns and operates the water works and also an electric-light plant. Pop., 1900, 6105; 1910, 7664.

PARIS. A city and the county seat of Bourbon Co., Ky., 113 miles by rail east of Louisville, on Stoner Fork of the Licking River, and at the junction of divisions of the Louisville and Nashville and the Frankfort and Cincinnati railroads (Map: Kentucky, F 3). It has a handsome courthouse, a hospital, and a Carnegie library. Situated in the famous "blue-grass

region" of Kentucky, Paris is engaged extensively in breeding fine horses. It is an important railway centre and has a large trade in whisky, tobacco, hemp, grass seed, etc. Paris was settled in 1784 and was chartered as a city in 1862. Pop., 1900, 4603; 1910, 5859.

PARIS. A town and the county seat of Oxford Co., Me., 24 miles from Auburn (Map: Maine, B 4). It has an imposing group of county buildings and a soldiers' monument. The manufacture of wood novelties constitutes the chief industry. Paris owns its water works. Pop., 1900, 3225; 1910, 3436.

PARIS. A city and the county seat of Henry Co., Tenn., 119 miles by rail west of Nashville, on a fork of the West Sandy River, and on the Louisville and Nashville and the Nashville, Chattanooga, and St. Louis railroads (Map: Tennessee, B 2). It is the centre of a fertile region, producing cereals, cotton, fruits, and tobacco, and has several tobacco, perfume, and medicine manufactures, planing mills, flouring mills, and repair shops of the Louisville and Nashville Railroad. The water works and electric-light plant are owned by the city. Pop., 1900, 2018; 1910, 3881.

PARIS. A city and the county seat of Lamar Co., Tex., 98 miles northeast of Dallas, on the Texas and Pacific, the Texas Midland, the St. Louis and San Francisco, the Gulf, Colorado, and Santa Fe, and the Paris and Mount Pleasant railroads (Map: Texas, E 3). It has fine United States court and post-office buildings, a county courthouse of granite, St. Joseph's Infirmary, the W. B. Aikin Charity Hospital, the Sanitarium of Paris, and a fine Country Club. The city is the centre of a productive cotton-growing region and controls extensive wholesale and shipping interests. Its industrial establishments include large cottonseed-oil mills, a large compress, cotton gins, a flouring mill, handle and crate factories, a box factory, a furniture factory, brick plants, etc. Paris, settled in 1841, is governed under a charter of 1905, which provides for a mayor, elected every two years, and a council, elected at large. The water works are owned and operated by the municipality, as is the abattoir, the first municipally owned and operated in America. Pop., 1900, 9358; 1910, 11,269; 1914 (U. S. est.), 12,081.

PARIS (Lat., from Gk. Πάρις, of unknown etymology), known also as ALEXANDER. In Greek legend, the second son of Priam, King of Troy, and Hecuba, and cause of the Trojan War. Before his birth his mother dreamed that she gave birth to a firebrand which set the whole city on fire, a dream interpreted by Helenus or by Cassandra to signify that the child she was about to bear would bring the city to destruction. To prevent this, Priam caused the infant to be exposed upon Mount Ida, where he was found and brought up by shepherds, among whom he distinguished himself. After a time he accidentally discovered his origin and was received by Priam as his son, but continued to live on Mount Ida, where he had won the love of the nymph Cénone, daughter of the river god Cebren. While on Ida he was appealed to as umpire in a strife which had arisen among the three goddesses, Hera, Athene, and Aphrodite, as to which of them was the most beautiful, the goddess Eris (strife) having revengefully flung among them at the marriage of Peleus, to which she had not been invited, a golden apple (of discord) inscribed *To the Most Beautiful*. Each of

the three endeavored to bribe Paris. Hera promised him dominion over Asia; Athene, military renown; Aphrodite, the fairest of women for his wife, Helen, the wife of Menelaus. Paris decided in favor of Aphrodite; hence the animosity which the other two goddesses displayed against the Trojans in the war that followed. Paris now equipped a ship and sailed to Sparta, where, with the aid of Aphrodite, he persuaded Helen to elope with him to Troy. Upon this followed the Trojan War, in which the princes of Greece joined Menelaus in his endeavor to recover his wife. In the *Iliad* Paris is at times represented as a cowardly boaster, disliked by his countrymen, while in other portions of the poem he is valiant and skillful in battle, especially with his bow, and is welcomed on his appearance by the Trojans. His manly beauty is more than once praised. In the epic he was said to have killed Achilles, while the latter was trying to force his way through the Scæan gate into Troy, but the later writers elaborated the story of Achilles' love for Polyxena and represented the Greek hero as enticed to the temple of Apollo and there murdered by Paris and Deiphobus. The *Little Iliad* told of the death of Paris by the arrow of Philoctetes, who owned the bow and arrows of Heracles. The Alexandrian writers, to whom the Cnemon episode is due, added the version that when Paris was wounded by the poisoned arrow he turned for healing to his old love on Mount Ida. She, however, refused to employ her magic skill, and the hero died, whereupon in remorse she destroyed herself. Representations of Paris are common in ancient art. On the earlier vases he appears at the judgment of the goddesses as a shepherd, often with the lyre and amid his flocks. Later he is usually distinguished by the Phrygian cap and sometimes by the close-fitting trousers and jacket worn by Asiatics.

PARIS, COMMUNE OF. See COMMUNE, *Paris*.

PARIS, CONGRESS OF. See CRIMEAN WAR; DECLARATION OF PARIS; PARIS, TREATIES OF.

PARIS, DECLARATION OF. See DECLARATION OF PARIS.

PARIS, *pâ'rēs'*, (GASTON (1839-1903). A French philologist. The son of Paulin Paris, he was born at Avenay, Aug. 9, 1839. He studied Romance philology for two years at Göttingen and Bonn, where he was for a while associated with the illustrious founder of modern Romance philology, Friedrich Diez. Having gone back to France, he worked at the Parisian Ecole des Chartes (1858-61) and became director of the Ecole des Hautes Etudes. He gave to his department of it such fame that students came to him from all parts of the world. He was also soon associated with the work in the Collège de France, and succeeded to the chair of his father when the latter retired in 1872. He was one of the staff of the *Revue Critique* from 1866 to his death, and in 1872 with his lifelong fellow worker, Paul Meyer, he founded the *Romania*, one of the most important of the Romance journals. In collaboration with Brachet (q.v.) and Morel-Fatio he translated the *Grammaire des langues romanes* of Diez (1874-78) and contributed extensively to the *Histoire littéraire de la France*. In 1895 Professor Paris was made director of the Collège de France, and in 1896 he was elected to the French Academy. He had become a member of the Institute in 1876. In 1889 his Swedish pupils issued a *Recueil de mémoires philologiques* (Stockholm) in honor of

his fiftieth birthday, while the following year a similar publication entitled *Etudes romanes* (Paris, 1891) was brought out by his French and foreign students on the occasion of the twenty-fifth anniversary of his doctorate. Since Sainte-Beuve, who gave little attention to linguistics, the French nation had had no critic so great as Gaston Paris. In him the philologist and the lover of beauty were at one. Reared as he was among literary men, towards the end of his life he was at the head of scientific literary criticism in France. He had no showy theories, but his discoveries were many and his knowledge was so wide that other great scholars were loath to assail his views. Yet his influence, which had been won by his steadfastly scientific attitude, and by the moderation, clearness, and charm of his thought, created no doctrinary school. He had rare personal dignity, a keen but sober wit, an extraordinary memory, and a wide acquaintance with men. Paris devoted himself mainly to the language and literature of France. He excelled not only in textual criticism, but in teaching and in arousing a sound love of old literature. In 1902 Paris became head editor of the *Journal des Savants*. He had other great work on hand when he died in Cannes, March 5, 1903, the most famous of Romance scholars, with disciples in all civilized countries. Some of the more important of his productions, besides the manifold articles to be found in the *Romania* and other reviews, are: *Etude sur le rôle de l'accent latin dans la langue française* (1862; new ed., 1896); *De Pseudo-Turpinio* (1865); *Histoire poétique de Charlemagne* (1865; 2d ed., 1905), his doctoral dissertation; *Les contes orientaux dans la littérature française du moyen âge* (1875); *Le petit Poucet et la grande Ourse* (1875); *La poésie du moyen âge* (1885; new ed., 2 vols., 1903-06); *La littérature française du moyen âge* (Paris, 1888; 4th ed., 1907; Eng. trans., London, 1903); *Poèmes et légendes du moyen âge* (1900); *Penseurs et poètes* (1896); *Extraits des chroniqueurs français* (1892; 5th ed., 1902), with A. Jeanroy; *Légendes du moyen âge* (1903). Perhaps his most fascinating work is his biography and literary estimate of François Villon (1901; 2d ed., 1910). Among the notable texts edited by him are the *Vie de Saint Aleais* (1872; 3d ed., 1903), with L. Pannier, and the *Extraits de la chanson de Roland* (1887; 8th ed., 1905); also *Merlin* (2 vols., 1886) and *Les miracles de Notre Dame* (8 vols., 1876-93). In 1909 his literary executor, M. Roques, published a volume of his studies entitled *Mélanges linguistiques*, treating of philological questions, and three years later (1912) edited his *Mélanges de littérature française du moyen âge*. Consult: Todd, "Gaston Paris, Romance Philologist and Member of the French Academy," in *Publications of the Modern Language Association*, vol. xii (Baltimore, 1897); Monod, "Gaston Paris," in *Revue historique*, vol. lxxxii (Paris, 1903); Bédier and Roques, *Bibliographie des travaux de G. Paris* (Paris, 1904); M. Croiset, "Notice sur la vie et les travaux de Gaston Paris," in the *Bibliothèque de l'Ecole des chartes*, vol. lxxv (ib., 1904); Bédier, *Hommage à Gaston Paris* (ib., 1904); W. P. Ker, "Gaston Paris," in the *Fortnightly Review* (London, July, 1904); id., *Essays on Medieval Literature* (New York, 1905); Nyrop, *Gaston Paris* (Copenhagen, 1906).

PARIS, JOHN AYRTON (1785-1856). An English physician and author. He was born

and was educated at Cambridge, where, after pursuing courses of study at Edinburgh, he took his medical degree in 1808. He began the practice of his profession in London, was made physician to Westminster Hospital, and later settled in Cornwall. There he obtained a large practice, studied natural history, and founded the Royal Geological Society of Cornwall. Returning to London, he lectured on *materia medica* and the philosophy of medicine at the Royal College of Physicians. He became a censor of the Royal College of Physicians in 1817, delivered the Harveian oration before it in 1843, and the next year succeeded Sir Henry Hallford in its presidency, retaining that office until his death. Among his works are a *Pharmacologia* (1812; 9th ed., 1843), long the standard treatise on the subject, *Medical Jurisprudence* (1823), a *Treatise on Diet* (1827, 5th ed., 1837); *Philosophy in Sport Made Science in Earnest* (1827, 8th ed., 1856), a popular treatise on physical science, and a *Life of Sir Humphry Davy* (1831).

PARIS, pa'rê', LOUIS PHILIPPE D'ORLÉANS, COUNT DE (1838-94) Pretender to the crown of France. He was born in Paris, Aug. 24, 1838, being the eldest son of Ferdinand, Duke of Orléans, and grandson of Louis Philippe. On the death of his father in 1842 the Count de Paris became the French heir apparent. He was carefully educated in Germany and later in England, whither his mother had removed after the events of 1848. A journey to Syria with his brother, the Duke de Chartres, in 1859, resulted in the publication of a journal of the voyage, entitled *Damas et le Liban*. Early in 1861 the Count de Paris became interested in the Civil War in the United States, offered his services with his brother's to the Federal government, and with their uncle, the Prince de Joinville, the two were attached to the staff of General McClellan, with the rank of captain. They were present at the siege of Yorktown and the battle of Fair Oaks and only retired when the attitude of France towards Mexico gave cause of offense to the United States. The Count de Paris returned to England in the summer of 1862 and shortly afterward began to appear as a contributor to the *Revue des Deux Mondes*, though under a nom de plume. In 1864 he married his cousin Isabella, the daughter of the Duke de Montpensier. In 1871 he was chosen to the National Assembly, which voted that his property in France, confiscated by Napoleon, should be restored. In 1873 the Count de Paris made a formal resignation of the claims of his family to the throne of France by a visit to the Count de Chambord at Frohsdorf, but after the latter's death in 1883 he was generally regarded as the Count de Chambord's successor and as the chief of the Legitimist party. By the Expulsion Act of 1886 the Count de Paris and his family were compelled to leave France. He settled in England and devoted himself to literary pursuits, though occasionally issuing a royal manifesto to the people of France. Of his eight children, the most noteworthy was the eldest, Philippe, Duke of Orléans. (See family article ORLÉANS.) The Count de Paris revisited the United States, where he was well received, in 1890. He died at Stowe House, Buckinghamshire, England, Sept. 8, 1894. Of his writings, the most important are: *De la situation des ouvriers en Angleterre* (1869), which has been translated into English and German, and *Histoire de la*

guerre civile en Amérique (1874-75), an able military history, which has been translated.

PARIS, MATTHEW (c.1200-59). The greatest English historian of the Middle Ages. In 1217 he entered the monastery of St. Albans, where Roger of Wendover (q.v.) was historiographer. When Roger died, in 1236, Paris took up the work of continuing the *Chronica Majora*, which had been brought to the year 1235. Paris evidently enjoyed a wide renown even in his own day, for in 1248 he was specially invited by King Haakon IV of Norway to reorganize the abbey of St. Benet Holm and was ordered by Pope Innocent IV to investigate its spiritual condition also. He returned to England in 1249, laden with presents. With the year 1250 Paris intended to end his chronicle, but new events aroused his interest, and the great work ended only nine years later. An abridgment which he prepared is known as *Historia Minor*, extends from 1067 to 1253, and contains a few incidents not noted in the *Chronica Majora*. In addition Paris wrote the *Vita Abbatis S. Albani* and the *Addamentum*; the latter contains charters, etc., supplementing both the *Chronica Majora* and the *Vita*. He died probably about May, 1259. In his own day Paris was considered a universal scholar and was indeed versed in most of the learning of his time. There is a continuation of his works ascribed to Rishanger (q.v.). All of the works of Paris are published in the *Rolls Series*. For other editions and works connected with Paris, consult: Augustus Jessopp, *Studies by a Recluse* (3d ed., London, 1893); August Potthast, *Bibliotheca Historica Medii Aevi*, vol. II (Berlin, 1896); Hans Plehn, *Politische Charakter Mathæus Parisiensis* (Leipzig, 1897); Charles Gross, *Sources and Literature of English History* (London, 1900).

PARIS, pa'rê's', PAULIN (1800-81) A French historian and philologist, father of Gaston Paris. He was born at Avenay, Marne. His appointment in the manuscript department of the National Library gave him opportunity to study the old French writers. He was made a member of the Academy of Inscriptions (1837), wrote memoirs for its publications and for those of other learned societies to which he belonged, and was professor of mediæval history in the Collège de France (1853-72). His most notable achievement was his catalogue, *Manuscrits français de la bibliothèque du roi* (1836-48). Besides other translations, he made a French edition of Byrón (1830-32-36). He edited the *Grandes chroniques de France* (1836-40) and other works. His own *Études sur François I* (1885) were published posthumously.

PARIS, TREATIES OF. The name given to important treaties of peace concluded at Paris in 1259, 1763, 1783, 1814, 1815, 1856, and 1898.

Louis IX of France appears to have doubted the validity of his title to some of the former possessions of the English princes, and so after 17 years of intermittent discussion the difficulty was settled in a treaty of peace with Henry III. This treaty, named from Abbeville, where the two kings met, and dated May 20, 1259, was in reality negotiated with Earl Simon de Montfort at Paris and concluded with Henry during his visit to France, November, 1259, to April, 1260. By its terms Henry surrendered all claim to Normandy, Touraine, Maine, Anjou, and northern Saintonge; receiving from Louis in return Périgord, Limousin, southern Saintonge, and some other territory south of the Loire, to be

held as fiefs. Henry gave up the titles of Duke of Normandy and Count of Anjou; while as Duke of Guienne and peer of France he agreed to do homage to the French monarch, this engagement being performed in the Garden of the Temple at Paris. The inhabitants of the district ceded to Henry were ill pleased, and in later times they refused to celebrate the saint day of Louis.

The Treaty of Feb. 10, 1763, was concluded between France and Spain on the one hand, and Great Britain and Portugal on the other, at the end of the Seven Years' War (q.v.). It provided for a cession to Great Britain of Canada, Prince Edward Island, Cape Breton, and the region east of the Mississippi River, possessed or claimed by France, except New Orleans and the isle on which it stood. Great Britain was confirmed in the possession of Nova Scotia. France retained a share in the fisheries of Newfoundland and the St. Lawrence, under certain restrictions, together with the isles of Saint-Pierre and Miquelon. In the West Indies Great Britain restored Martinique and Guadeloupe, and ceded St. Lucia to France, while France ceded to Great Britain Dominica, St. Vincent, Grenada, and Tobago (the last previously neutral territory). France ceded Senegal to Great Britain. She recovered possession of Pondicherry, but had to agree not to maintain military settlements in Bengal. In Europe France relinquished her conquests in Germany, restored Minorca, and engaged to maintain the status quo. By way of compensation for the loss of Florida, which Spain ceded to Great Britain, which had fallen into the hands of that Power, France ceded to Spain the bulk of Louisiana, including New Orleans. The effect of the treaty was to establish the supremacy of Great Britain in America, in India, and on the seas.

The Treaty of Paris of Sept. 3, 1783, between Great Britain and the United States, marked the close of the American Revolution and recognized the independence of the Colonies. Simultaneously with its conclusion Great Britain made peace with France and Spain at Versailles. The four difficult questions upon which the British and American negotiators labored at great length before reaching a settlement related to (1) the boundaries of the United States, (2) fishing rights on the coast of Newfoundland, (3) payment of private debts due from Americans to British creditors, and (4) compensation of the Loyalists. As finally concluded, the treaty recognized the Mississippi River as the western boundary from a point west of the Lake of the Woods to the thirty-first parallel of north latitude; thence the boundary was to run due east to the Appalachicola (Chattahoochee) River, thence down the middle of that stream to the Flint River, thence to the head of the St. Mary's River, and thence along the middle of that river to the Atlantic Ocean. The Great Lakes and the St. Lawrence River were recognized as the northern boundary to the forty-fifth parallel. Thence to the Atlantic Ocean the boundary was described as following the highlands which divide those rivers that empty themselves in the St. Lawrence from those which empty into the Atlantic, thence from the highlands to the source of the St. Croix River, and thence down that stream to its mouth. (See NORTHEAST BOUNDARY DISPUTE; also NORTHWEST BOUNDARY DISPUTE.) With regard to the fisheries it was provided that the Americans were to continue to enjoy the same rights of fishery at Newfound-

land and vicinity which they had enjoyed as English colonists, and while they were to be permitted to dry their fish on other unsettled shores, they were not allowed to do so on the island of Newfoundland. At the same time they were to have the exclusive right of fishing on their own coasts. On the third point it was provided that creditors on either side should meet with no lawful impediment to the recovery of the full value in sterling money of all bona fide debts contracted before the war. With regard to the Loyalists, the American negotiators consented that Congress should be asked to recommend to the State legislatures to provide for the restitution of confiscated estates and to abandon all future confiscations and to cease all prosecutions commenced against persons known as Loyalists. The navigation of the Mississippi was declared to be free to the subjects of both nations. By the terms of the Treaty of Versailles, signed on the same day as that of Paris, Great Britain restored Florida and Minorca to Spain and ceded Tobago to France. Senegal was relinquished to France.

The Treaty of Paris of May 30, 1814 (First Peace of Paris), was concluded between France on the one hand and the representatives of all the great Powers of Europe on the other. It provided that France should surrender all her conquests except slight territories on the northern and eastern boundaries, leaving her with the boundaries of 1792. She was to pay no indemnity and was to retain all works of art taken from conquered countries with a few exceptions. Most of the colonies taken from her by Great Britain were restored; Holland was restored to the house of Orange; of the colonial possessions wrested from Holland, Great Britain retained Ceylon, the Cape of Good Hope, and part of Surinam (Guiana); Switzerland was declared independent; Italy, except the Austrian provinces, was to consist of independent states, a similar arrangement was made for Germany; the navigation of the Rhine was to be open; and the settlement of all other questions of European concern was to be entrusted to a European congress to be convened at Vienna. (See VIENNA CONGRESS.) By secret provisions it was agreed that the allies should control the distributions of territory at the congress, that Austria should receive northern Italy, that the King of Sardinia should receive Genoa, and that Belgium and Holland should be united as a defensive territory against France.

The Treaty of Paris of Nov. 20, 1815 (Second Peace of Paris), was concluded between France on the one hand and the allies on the other and materially modified the Treaty of 1814. By this treaty France was deprived of certain small territories to the north and east which she had been allowed to retain by the Treaty of 1814. She was also compelled to pay indemnities to the allied Powers for the expenses of the war, amounting to some £40,000,000; to consent to the occupation of her frontier provinces for a period of five years by an allied army of 150,000 men and to defray the cost of this occupation out of her own revenues. Indemnities to a large amount were allowed several of the allies for the spoils committed on them by the French armies, the total amount of the entire indemnity exceeding £60,000,000.

The Treaty of Paris of March 30, 1856, was concluded among the Powers at the close of the Crimean War (q.v.) and settled a number of

questions of European public law of great importance. It provided that the Black Sea should be neutralized and that it should be thrown open to the merchant marine of every nation. All war vessels of every nation, including Russia and Turkey, were forever prohibited from entering that sea. The Czar and the Sultan agreed not to establish upon its coasts any military fort or arsenal. A portion of Bessarabia was surrendered by Russia, and the river Danube was declared to be open to free navigation. For the purpose of insuring free navigation and for policing and improving the river, it was placed under the supervision of an international commission. This provision was declared to be a part of the public law of Europe. The Sublime Porte was formally admitted to the European concert, and the Powers engaged to respect the independence and integrity of the Ottoman Empire. The Danubian principalities of Moldavia and Wallachia were to continue under the suzerainty of the Porte, Russia renouncing her protectorate over them and the Powers guaranteeing all the privileges and immunities of which they were then in possession. Several important principles of international law were agreed upon at the same time and were embodied in the Declaration of Paris (q.v.).

The Treaty of Paris of Dec. 10, 1898, terminated the Spanish-American War. Spain relinquished her sovereignty in Cuba and ceded Porto Rico, the Philippine Islands, and the island of Guam to the United States, from which she received the sum of \$20,000,000.

Bibliography. Michel Gavrilovitch, *Etude sur le traité de Paris de 1259* (Paris, 1899); John Jay, *On the Peace Negotiations of 1782-1783* (New York, 1888); *Recueil des traités et conventions entre la France et les puissances alliées en 1814 et 1815* (Paris, 1815); *Les traités de 1815* (ib., 1859); Julius Königer, *Der Krieg von 1815 und die Verträge von Wien und Paris* (Leipzig, 1865); Edward Gourdon, *Histoire du congrès de Paris, 1856* (Paris, 1857); W. Reid, *The Treaty of Paris, 1898* (New York, 1899).

PARIS, UNIVERSITY OF. One of the oldest and largest universities in the world. It had its inception in the schools of Notre Dame, Ste. Geneviève, and St. Victor and first comes into prominence about 1170. In the early part of the twelfth century Paris was already the noted seat of a number of great masters, among whom were William of Champeaux and his pupil Abélard (q.v.). Thousands of scholars from all over Europe flocked to Paris. Hence arose the necessity for common protection against the impositions of citizens and particularly against the chancellor of Notre Dame, who possessed the right to grant the "license to teach" and thus constituted the quasi head of the university, and from a mere association of masters there gradually developed a corporation with special rights and privileges. In 1200 Philip Augustus granted a charter conceding among other privileges the right of students to be tried in an ecclesiastical court. In 1207 there is mention made of *Comunitas Scholarium* and *Universitas Magistrorum*, indicating a fully organized Studium Generale. The chancellor's power to grant licenses was somewhat neutralized by the custom of Inception, which obliged a candidate to deliver an inaugural address before being permitted to associate with the masters. In 1229 a bloody fight between students and citizens caused an emigra-

tion which greatly benefited Oxford. Two years later, however, Pope Gregory IX came to the assistance of the university, and masters and scholars returned in large numbers. Popes Honorius III and Gregory IX, by siding with the masters in these disputes, acquired an enormous influence over the affairs of the university. The corporation, which at first was nothing more than an association of masters, now consisted of masters and scholars, although the right to vote was vested in the masters only. The university was divided into the superior faculties, viz., theology, medicine, and law, and the inferior faculty of arts. However, on account of the predominance of their number the rector of the faculty of arts became practically the head of the university in the fourteenth century. The arts faculty was divided into four nations: French, Picards, English, and Normans. In the congregations of the university there were seven voices, the nations controlling four and the other faculties three. In the middle of the thirteenth century the university entered into a series of litigations with the aggressive Mendicants, who included among their teachers such men as Thomas Aquinas, Alexander of Hales, and St. Bonaventura. They established three chairs in theology without taking the oath of obedience to the university statutes. After a struggle of seven years the Pope decided against the masters, and the Mendicant scholars were placed on a basis of equality with the seculars. The contest with the Mendicants, however, was fortunate in that a series of "colleges" or foundations modeled after those of the orders where laymen could get lodging, care, and instruction were established. The most famous of these were the Sorbonne (q.v.), founded by the Robert de Sorbon about 1257, and the College of Navarre.

In the fourteenth and fifteenth centuries the university attained its highest stage of development. Prince and popes courted its favor and followed the teachings of its famous theologians and jurists. It became the centre of the educated world. However, its conservative attitude towards the humanism of the fifteenth century; the civil wars; the constantly increasing centralization of the French government, which crippled free university life—all contributed towards the gradual decline of its fame. The theological faculties, owing to the establishment of the bishop seminaries, lost their prestige as educational institutions and degenerated into mere degree-conferring bodies. The famous jurists also forsook Paris for the practical business of administration in the provinces. The faculties of arts and the colleges came to serve the purposes of secondary education, while most of the higher education fell into the hands of the Jesuits, who established a number of colleges in France. The university never flourished again as during the mediæval period. Henceforth the great scholars of France were connected with the Academy. During the Revolution the university went down with the rest of the French universities. In 1808 Napoleon reorganized it as part of the University of France, and until 1896 it was known as the *Facultés de Paris*. In 1914 it consisted of the following faculties, school, and administrative body: (1) the conseil de l'université; (2) the Protestant theological faculty; (3) the medical faculty, including the Musée Dupuytren, established in 1835; (4) the law faculty; (5-6) faculties of science and letters at the Sorbonne; (7) the school of

pharmacy. The total attendance in 1912-13 was 17,556. The libraries contained about 900,000 volumes and more than 2300 manuscripts. Consult: Jourdain, *Histoire de l'université de Paris au XVII^e et au XVIII^e siècle* (Paris, 1862-66); Budinszky, *Die Universität in Paris und die Fremden an derselben im Mittelalter* (Berlin, 1876); Denifle and Chatelain, *Chartularium Universitatis Parisiensis* (Paris, 1889 et seq.); C. F. Thwing, *Universities of the World* (New York, 1911). See UNIVERSITY.

PARIS BASIN. A geologic basin eroded in the Cretaceous rocks of the vicinity of Paris and subsequently filled with Tertiary marls and sands. The basin occupies an oblong area of about 20,000 square miles, which is divided by the Seine into a northern and a southern half. The underlying strata are chiefly remarkable for the rich harvest of organic remains which they supplied to Cuvier, and which led to the foundation of the modern science of paleontology.

PARIS GREEN, SCHWEINFURTER GREEN, or EMERALD GREEN. A double compound formed by the union of copper acetate and copper arsenite. Its composition may be represented by the formula $(C_2H_3O_2)_2Cu.(AsO_3)_2Cu$. It is insoluble and, as one of its names indicates, has an emerald-green color. It was formerly much used as a pigment, especially for wall paper, but its use has been largely discontinued on account of its exceedingly poisonous nature. It is used as an insecticide (q.v.).

PARISH (OF. *parosse*, *paroiche*, Fr. *paroisse*, from Lat. *paracia*, *parochia*, from Gk. *παροικία*, *paroikia*, ecclesiastical district, from *παροικος*, *paroikos*, neighboring, from *παρά*, *para*, beside, beyond + *oikos*, *oikos*, house). A division either of territory or population, originally ecclesiastical, but in some places also civil. The word in its Greek form was applied in its earliest ecclesiastical use to a body of Christians living in a city and its neighborhood to distinguish them from the other inhabitants. Gradually it came to mean the district under the care of a bishop, then the divisions of the district in charge of resident presbyters. The subdivision of the dioceses of the kingdoms of England into what are now known as parishes is not supposed to have taken place much earlier than the time of King Edgar (970), the boundaries of the parishes being fixed by those of manors. In this later ecclesiastical sense the parish came to be the territory committed to the charge of one priest. But since the modern development of the English poor laws the term "parish" in the statutes defines a district for which a separate poor rate is or may be made and a separate overseer appointed. On the temporal side the administration is in the hands of the vestry and especially of the churchwardens, one of whom is usually nominated by the incumbent, the other elected by the ratepayers. Their duties are to have a care for the fabric of the church and other property, preserve order during divine service, and provide whatever is necessary for its due celebration. There has for many centuries been an apparent confusion in the use of the term, arising from the fact that, as a rule, the same body of individuals represented both the civil and the religious organizations. From an early period, however, the ecclesiastical side of the parish has predominated over the civil side, and this was the condition of affairs at the time of the first English settlements in America. It was in Virginia that the parish as it existed

in England was developed, although, on account of the peculiar circumstances of the colony, it came later than the military and civil divisions and therefore never possessed civil powers equal to the parishes of the mother country. The word "parish" was used in the New England Colonies to denote the township from the ecclesiastical point of view as well as a portion of a township not possessing town rights. In the United States at the present time the word "parish" as an ecclesiastical district is used loosely by the Episcopal and Reformed Episcopal churches and often with a more definite territorial limitation by the Roman Catholic church. In the Episcopal church the parish is the local unit of organization and, as a rule, possesses a corporation composed of the rector, wardens, and vestrymen. The term is used generally in churches either for the district within which the adherents of the church reside or for the legal ecclesiastical organization. In Louisiana the term "parish" is given to the civil territorial divisions called counties in other States.

PARISH-ALVARS, pā'rish-āl'vārz, ELIAS (1808-49). An English harpist and composer, born at West Teignmouth. He studied under Dizi, Labarre, and Bochs, after 1831 toured in concert over much of Europe and the East, and in 1847 became Imperial chamber harpist at Vienna. His compositions, ranking among the best for the harp, include the collection *Voyage d'un harpiste en Orient*, two harp concertos, a *concertino* for two harps and orchestra, characteristic pieces, fantasias, and romances.

PARISH CLERK. An officer in the parishes of the Church of England and in some of the colonial churches of the Anglican communion. It is the duty of a parish clerk to represent the congregation in public worship. Formerly clerks in holy orders were appointed, but now a clerk is usually a layman, who by the canon law is required to be at least 20 years of age and of competent skill to perform his office.

PARISH SCHOOL. A term applied to institutions located in the district called the parish.

In the capitulary of 789 Charles the Great directed every monastery to have its school where boys might be taught the Psalms, the system of musical notation, singing, arithmetic, and grammar. Such schools would, of course, reach only a very little beyond those designed for the Church, but in 796 Theodulphus, Bishop of Orléans, issued a similar capitulary to the clergy of his diocese, requiring them to give gratuitous instruction to the children of the laity in every town and village. From time to time other decrees by both church and state attempted to render more effective the popular instruction that the clergy of France were supposed to give. After the revocation of the Edict of Nantes (1685) Louis XIV decreed that there should be in every parish a school to teach the Roman Catholic religion, reading, and even writing. The Brethren of the Christian Schools, founded in 1679 by La Salle, a canon of the cathedral church at Rheims, afforded a most effective means of education for the common people.

The early Protestant reformers—Luther, Melancthon, Zwingli, Knox, and others—were anxious that the common people should have proper religious instruction, and to this end they deemed the rudiments of reading and writing of the greatest importance. They urged upon

the pastors the duty of attending to this matter, and the early Protestant parish schools either were taught by the pastors or their assistants or were at least under their supervision. As the schools were taken in hand by the state, ecclesiastical supervision was retained, and it has been done away with very slowly, vestiges of it remaining in Prussia even to-day. See **PARISH**.

Consult M. Arnold, *Popular Education of France* (London, 1861), and Graham Balfour, *Educational Systems of Great Britain and Ireland* (Oxford, 1903).

PARISINA, pā-ré-zō'nā. An opera by Mascagni (q.v.), first produced in Milan, Dec. 15, 1913.

PARISIUS, pā-ī'sē-ūs, LAUDOLF (1827-1900). A German politician and author. He was born at Gardelegen, studied law at Halle, and practiced in his native town. In Berlin he became prominent in the politics of the Progressist party as an editor of the *Parlamentarische Korrespondenz aus der Fortschrittspartei* and a member of the Prussian House of Deputies. Afterward he joined the National Liberal party and sat in the Reichstag in 1874-77 and 1881-87. In 1871 he was made conspicuous by his attacks on Von Mühler, Minister of Education. Consult his *Ein preussischer Kulturminister der seinen Beruf verfehlt hat* (15th ed., 1871). He wrote various legal commentaries; a valuable history, *Deutschlands politische Parteien und das Ministerium Bismarcks* (1877), several legal works; the biography *Lieopold Freiherr von Hoyerbeck* (1897-1900); and several novels.

PARISOT DE LA VALETTE, JEAN. See VALETTE, JEAN PARISOT DE LA.

PARIS SKETCH-BOOK, THE. A collection of sketches and stories by W. M. Thackeray (1840).

PARIS TRIBUNAL OF ARBITRATION. See SEALING.

PARIS WHITE. See CHALK.

PARJANYA, pār-jūn'ya. In the Veda (q.v.), the rain god. He is mentioned about 30 times in the Rig-Veda, where he is celebrated in three hymns. His action, however, is not wholly independent, as he, like the Maruts, is subject to Mitra and Varuna (q.v.). Parjanya, as being a rain deity, is frequently associated with thunder and occasionally also with lightning. It naturally follows from his functions that he is in a special degree the god who promotes and fosters vegetation. His wife is by implication the earth, although one passage of the Atharva-Veda expressly calls her name Vasa. Parjanya is mentioned in connection with several other deities, especially with Vata, the wind, and less often with the Maruts, the storm gods, and with Agni, the fire. He has likewise many points of resemblance with Indra (q.v.), with whom in the epic he is regularly identified. Parjanya is often thought to be identical with the Lithuanian thunder god Perkūnas, but this view must be regarded as more inviting than probable. Consult A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897), and id., *History of Sanskrit Literature* (London, 1913).

PARK (ME. *park*, *parrok*, from OE. Fr. *pare*, and from AS. *pearroc*, OHG. *pfarrich*, Ger. *Pferch*, park, of uncertain etymology, possibly connected with provincial Eng. *par*, inclosure for domestic animals, and with OHG. *sparro*, Ger. *Sparren*, Eng. *spar*). In English law, an inclosed area of forest land containing "wild beasts of the chase," particularly deer. The

right to hunt in a park was a prerogative of the crown and could be gained by a subject only by royal grant or by prescription. When so acquired it was a franchise and was alienable and usually inheritable like other real property. See **FOREST LAWS**; **GAME LAWS**.

PARK. A tract of land, however large or small, which is devoted to public use and enjoyment. Its object is threefold: adornment, the collection and nurture of plants and animals, the enjoyment of the people. Under this definition any open space set apart for rest or recreation is a park, whether it be as formal as Versailles, as picturesque as Fontainebleau, or as wild as the Yosemite valley. Even grass may be omitted, and yet the park remains, as in the Tuileries at Paris, where the entire surface not occupied by pavements, groups of shrubs, or parterres of flowers, is covered with loose gravel, through which water percolates to the tree roots, and over which there is no restraint of popular use.

A park may be controlled by a city, by a number of adjoining cities acting together as a district, by a state, or by a nation. City parks include city squares, commons, botanical and zoological gardens, parkways and boulevards, and frequently public playgrounds. (See **PLAY-GROUNDS AND RECREATION CENTRES**.) In recent years, under the inspiration of the city-planning (q.v.) movement, there is a growing tendency to develop these different forms of city parks according to a definite and well-worked-out plan, broad enough in its scope to provide for the needs of a city's population for rest and recreation in the open air.

The practice, however, of reserving public parks for the use and delight of the people is as old as civilization. The Egyptian parks were small and formal, ornamented with colonnades and other architectural features. Very different were the parks of the Assyrians and later Persians, who reserved and lavishly decorated vast areas of mountain. Greek parks were small and formal, like those of the Egyptians. In Rome in the time of the Caesars there were, according to Lanciani, eight camps or commons, and 30 parks belonging to the city, of which the most extensive was the Campus Martius. During the Middle Ages public parks were little thought of, but during the Renaissance many beautiful public parks and gardens were laid out which are still the ornament of many European cities. The history of the defense of the cities of mediæval Europe explains the location of many of their parks. Nearly every town formerly had its wall and surrounding ditches and reserve of open ground outside kept clear for military defense, all belonging to the state. These walls and adjacent grounds, before as well as after the fortifications were razed, were the promenades of the people, and in modern times have been converted into parks and boulevards. Towns which have grown greatly have had several successive circles of inclosing fortifications, thus providing, as in Paris and Vienna, a series of concentric rings of public promenades, boulevards, and commons.

The area of parks in London is proportional to the immensity of the city. Its seven great parks are Hyde Park, containing about 400 acres, intersected by walks and carriage roads (including the famous saddle-horse road called Rotten Row), clothed with old forests and graced by the lake called Serpentine; Kensington

Gardens, an adjoining royal park of about 240 acres, farther from the city; Green, a smaller pedestrian park, by which Hyde Park may be approached; Regent's, nearly circular, with 472 acres, and having zoological and botanic gardens; Victoria Park, with 217 acres; Battersea Park, 200 acres; Kennington Park, 20 acres. These are almost exclusively for pedestrians as well as the great Botanic Gardens of Kew outside of London. Paris is noted for the elegance and great number of its small parks and avenues for promenades. The Bois de Boulogne, an ancient wood belonging to the crown, was given to the public about 1852. It contains 2250 acres. Carriage drives and promenades traverse it in every part, and four artificial lakes are its most interesting feature. The old gardens of the Tuileries, already alluded to, and the gardens of the Luxembourg are so completely enjoyed by the public that they fill all the uses of parks. Paris is provided with park resorts outside of the city to a greater extent than any other city. All the old chateau forests and hunting grounds of successive kings of France are now the property of the state and furnish attractions in every direction from the city. Saint-Cloud, Versailles, Vincennes, and Fontainebleau, the last named one of the most picturesque and extensive of old royal hunting forests, are the most noted. The Thiergarten at Berlin, having an area of 630 acres, and the 2000-acre park at Vienna should be mentioned among the famous European parks.

In the United States public parks on a small scale are as old as the cities. A seaside walk was a common form. The Battery in New York and the Bay Side in Charleston, S. C., are familiar examples. The City Hall Park in New York was originally a playground or common. Boston Common was specifically dedicated to public use by the founders of the city and has more perfectly fulfilled its use than any other equal area in the country. Public squares in nearly all the cities, notably around Yale College in New Haven, have shown the noble expression that may be given to a very limited park by avenues of full-grown native trees. The period of land speculation in the middle of the nineteenth century, when great numbers of cities in the Middle West were founded, was peculiarly unfortunate in the failure to dedicate ground liberally either in park places, public squares, or larger grounds. Many of the so-called "boom" cities which have since been planted farther west have provided for parks and other public grounds in a most liberal manner. In 1851 the city of New York secured special legislation to create Central Park. The property was secured in 1857, and the plans for its development submitted by Frederick Law Olmsted and Calvert Vaux were adopted and put in their charge to be executed. The ground occupied is $2\frac{1}{2}$ miles long north and south and $\frac{1}{2}$ mile east and west. Exclusive of city water works, reservoirs, artificial pleasure lakes, and building sites, the park contains 683 acres. About 110 acres are in lawn, little broken by rocks and only bordered by trees, and the remainder mostly broken ground, in glades and forests, or covered with copses and shrubbery, but nearly all in a condition to have a surface lawn. The grand terrace by Mr. Vaux—the first great work of park architecture executed in the United States—is an admirable study. Prospect Park, in the Borough of Brooklyn, is an outgrowth of the enthusiasm developed

by the creation of Central Park. It contains 550 acres, all of which is available for park use. Fairmount Park in Philadelphia, having an area of 2648 acres, is probably the largest park within the limits of any city. It stretches along the banks of the Schuylkill River. The Wissahickon, flowing through ravines and over numerous waterfalls, imparts a peculiar beauty to the park. Baltimore has a forest park, Druid Hill, of 700 acres, acquired in 1800. Chicago has a magnificent system of parks, of which Jackson Park, comprising a splendidly equipped area of 586 acres, is the foremost. St. Louis with its Forest Park of 1372 acres and Detroit with its Belle Isle of 700 acres furnish examples of liberal provision of park area by American cities. In recent years, under the influence of the fresh-air and recreation movements, there has been a disposition on the part of most city governments not only to acquire additional park areas, but also to make better use, so far as the actual needs of the people are concerned, of the land already possessed. Large tracts are being set off for ball fields, children's playgrounds, and other recreational uses, and the sign Keep off the Grass is no longer ubiquitous.

With the advent of the trolley the outskirts of cities became accessible to the inhabitants, so that parks many miles distant may be reached in a comparatively short time and for a trifling sum. Many of the trolley companies have themselves taken advantage of this fact by fitting up parks on their lines for the sake of the traffic they attract. Descriptions of scores of such parks may be found in the street-railway journals. In Kansas City, e.g., there were five such parks which had in the summer of 1911 an attendance of 1,991,780, spending \$669,605. In a bulletin on "Public Recreation," published by the University of Wisconsin in 1915, the good and evil influences of these commercial amusement parks are described in detail. The enormous popularity of such parks justifies their careful study and their strict oversight as well. Such parks are often outside city limits and so beyond city control. See PLAYGROUNDS AND RECREATION CENTRES.

The feasibility of extended park areas outside the urban centres has also given rise to a form of coöperation between neighboring municipalities which has great possibilities. The most noted example of such coöperation of adjoining cities for the common good is the formation in 1907 of the Metropolitan Park System for Boston and its vicinity. This system includes over 9000 acres of parks, many miles of parkways extending along 30 miles of river banks and 8 miles of seashore, and also immense ocean-bathing establishments. Another example of such coöperation is the formation, in the same year, of the Essex County Park System of New Jersey, nearly 4000 acres in extent. This includes not only parks in the city of Newark and in the heart of the other municipalities in the system, but also a large area of wild land stretching along the ridge of the Orange Mountain and commanding a magnificent view of New York City and the intervening country—the homes of the greatest number of people gathered together in an equal area in the world. To have set aside in perpetuity as a recreation ground for the people such an area in the heart of what may be eventually the largest and most congested population in the world is an act whose importance can scarcely be overestimated.

Passing on to the consideration of those larger parks which have been set aside by state rather than municipal governments, we find a surprising number of such areas in the United States. Massachusetts has acquired large holdings in three different ways: (1) through direct appropriation of funds and purchase of land by the State; (2) through State-appointed commissions; (3) through boards created to receive and care for gifts of land to the State. New York also has some notable possessions: these include the Adirondack Reserve besides important small tracts at Niagara Falls and in the gorge of the Genesee River, in Watkins Glen, and at Stony Point. Coöperating with New Jersey through the Palisades Interstate Park Commission, it is developing a tract along the west bank of the Hudson River known as the Palisades Park. Wisconsin has a State park board of three members, appointed by the Governor. In 1910 this newly appointed board purchased 3800 acres of land in Deer County, including 8 miles of bay shore. California has invested \$250,000 in a State park near Boulder Creek, containing a wonderful growth of redwood. Minnesota, Michigan, and Kansas have all acquired State parks. See CITY PLANNING; PARK, NATIONAL; PARK, NATIONAL MILITARY.

Consult: A. W. Crawford, *Development of Park Systems in American Cities* (Philadelphia, 1905); John Nolen, *Parks and Recreation Facilities* (ib., 1910); T. H. Mawson, *Civic Art* (New York, 1911); the quarterly magazine, *Landscape Architecture*, and publications of the American Park and Outdoor Association (Philadelphia, 1897-1904).

PARK, MILITARY. Any inclosed space in which are stored either guns, wagons, or supplies. Specifically an artillery park is one consisting of guns and their equipment, and similarly an engineers' park would consist of wagons, pontoons, animals, etc. Wagons or other train vehicles, brought together for purposes of storage, camping, or for defense against attack, are said to be parked.

PARK, NATIONAL. In the western portion of the United States, where there have been public lands belonging to the Federal government, Congress has from time to time created national parks in order to protect the wonders of nature, to serve as places of refuge for the wild life of the forests and mountains, and to prevent the private acquisition of land that is valuable to the public for purposes of health and recreation.

The oldest of these parks is the *Hot Springs Reservation*, in central Arkansas, which was reserved from disposition by the Act of April 20, 1832. The present boundaries were fixed and the area dedicated as a public park by the Act of June 16, 1880. Adjacent to the reservation and extending between portions of it is the city of Hot Springs (q.v.), which is in no way under the control of the Federal government. This reservation, which has an area of only 911 acres, was created because of the great value of the hot waters in the treatment of rheumatism and certain other diseases. There are 46 hot springs on the reservation, the waters of which are piped to 20 bathhouses operated as private enterprises under the supervision of a superintendent appointed by the Secretary of the Interior. The Department of the Interior operates a free bathhouse for the indigent sick, and the War Department maintains a general hospital for officers and men of the army and navy, for officers of

the coast guard and the public-health service, and for honorably discharged soldiers and sailors of the regular and volunteer forces of the army and navy.

Yellowstone National Park (q.v.), established by the Act of March 1, 1872, has an area of 2,142,720 acres. The greater part of the park is in Wyoming, but a narrow strip along the northern boundary is in Montana, and a similar strip along the western boundary is in Montana and Idaho. On the north a branch line of the Northern Pacific Railway extends to the park boundary at Gardiner, Mont.; on the west a branch line of the Oregon Short Line Railroad extends to the park boundary at Yellowstone, Mont.; on the east the park is 63 miles distant from Cody, Wyo., the terminus of a branch line of the Chicago, Burlington, and Quincy Railroad.

Yosemite National Park (q.v.), established as a national park by the Act of Oct. 1, 1890, has an area of 719,022 acres. It is, however, even older than the Yellowstone as a public reservation, as the Yosemite valley and the Mariposa grove of big trees were granted to the State of California for a public park by the Act of June 30, 1864. Yosemite National Park outside of Yosemite valley and the Mariposa grove of big trees was established by the Act of Oct. 1, 1890. The Yosemite valley and the Mariposa grove were ceded to the United States by the Legislature of California by the Act of March 3, 1905. This cession was accepted by Congress on June 11, 1906, and only since that date has the area that now constitutes Yosemite National Park been under the exclusive control of the Federal government. By the Act approved Dec. 19, 1913, the city and county of San Francisco was authorized to use the Hetch Hetchy valley for storing water for a municipal water supply. This park is best reached from El Portal, the terminus of the Yosemite Valley Railroad, whence a 16-mile trip brings the traveler to Yosemite village in Yosemite valley.

Sequoia National Park, in California, established by the acts of Sept. 25 and Oct. 1, 1890, has an area of 161,597 acres. This park may be reached from Visalia, on the Southern Pacific and Atchison, Topeka, and Santa Fe railroads, thence by way of electric railway to Lemon Cove, thence 40 miles by stage to the park. This park was established in order to preserve the fine groves of big trees or sequoia (q.v.) that are found within its borders. There are 12 groves of big trees and about 12,000 trees exceeding 10 feet in diameter. The park also contains scenic areas of great beauty.

General Grant National Park, established by the Act of Oct. 1, 1890, has an area of 2536 acres. This park is near the Sequoia Park, from which it may be reached by trail. It may also be reached from Sanger, on the Southern Pacific Railroad, 46 miles distant, or from Cutler, on the Atchison, Topeka, and Santa Fe Railway, 39 miles distant. The features of this park are similar to those of the Sequoia National Park.

Casa Grande (q.v.) *Ruin*, in Arizona, has an area of 480 acres. It was established by presidential proclamation of June 22, 1892, issued under authority of the Act of March 2, 1889. The reservation is 12 miles from Florence, on the Arizona Eastern Railroad, and the same distance from Casa Grande, on the Southern Pacific Railroad. See CASA GRANDE.

Mount Rainier National Park, in west-central Washington, established by the Act of March

2, 1899, has an area of 207,360 acres. This park is best reached from Ashford, a station on a branch line of the Chicago, Milwaukee, and St. Paul Railway, $6\frac{1}{2}$ miles distant from the southern boundary; it may also be reached by trail from Fairfax, $6\frac{1}{2}$ miles distant, on a branch line of the Northern Pacific Railway, as well as by automobile from Seattle, 60 miles distant, and Tacoma, 50 miles distant. The park includes a single great peak, Mount Rainier (q.v.), and its outlying ridges and intervening valleys. Around this mountain, which rises to an elevation of 14,408 feet, is the largest glacial system in the United States radiating from a single peak. The wonderful fields of wild flowers which extend almost to the edge of the ice fields constitute one of the great attractions of this reservation. Over 350 species of ferns and flowering plants grow on this mountain, including great fields of heather, heliotrope, avalanche lilies, anemones, columbines, and larkspur.

Crater Lake National Park (q.v.), in central Oregon, established by the Act of May 22, 1902, has an area of 159,360 acres. On the west this park is reached from Medford, 85 miles distant, on the main line of the Southern Pacific Railroad; on the east it is reached from Chiloquin, 36 miles distant, on a branch line of the Southern Pacific Railroad.

Platt National Park, in Oklahoma, established by the acts of July 1, 1902, and April 21, 1904, has an area of 848 acres. It was first known as the *Sulphur Springs Reservation*, but the name was changed to Platt National Park by the joint resolution approved July 29, 1906. The park is immediately adjacent to the town of Sulphur, on the Atchison, Topeka, and Santa Fe and St. Louis and San Francisco railroads. Within the park are a number of mineral springs, the waters of which are used locally to a considerable extent.

Wind Cave National Park, in South Dakota, established by the Act of Jan. 9, 1903, has an area of 10,522 acres. It is 10 miles from the town of Hot Springs, S. Dak., on the Chicago, Burlington, and Quincy and the Chicago and Northwestern railroads. The chief attraction is a limestone cave, which is accessible to a depth of 400 feet below the surface. A portion of the park has been inclosed in order to serve as a bison range for a herd of these animals presented by the American Bison Society.

Sullys Hill Park, in North Dakota, has an area of 780 acres. It was established by presidential proclamation of June 2, 1904, issued under authority contained in the Act of April 27, 1904. It may be reached from Devils Lake, Tokio, and Narrows stations, on the Great Northern Railway. The park comprises a wooded tract on the shore of Devils Lake.

Mesa Verde National Park, in southwestern Colorado, established by the Act of June 29, 1906, has an area of 48,996 acres. It is best reached from Mancos on the Denver and Rio Grande Railroad, 25 miles distant. The park was created in order to protect the ruins of the cliff dwellers. (See CLIFF DWELLER.) In it there are over 300 cliff dwellings, but only three—Cliff Palace, Spruce Tree House, and Balcony House—have been repaired. Cliff Palace, the largest ruin, is about 300 feet long and probably supported a population of over 400 persons. See MESA.

Glacier National Park, in northwestern Montana, established by the Act of May 11, 1910,

has an area of 981,681 acres. It is reached from Belton and Glacier Park stations on the main line of the Great Northern Railway, which runs along the southern border of the park. While this park receives its name from the many glaciers that are found on the high summits, it is as much renowned for its beautiful lakes and their surrounding forests and mountains. Along the continental divide of the Rocky Mountains, which runs northwest and southeast through the park, is some of the finest scenery on the American continent.

Rocky Mountain National Park, in central Colorado, established by the Act of Jan. 25, 1915, has an area of approximately 229,000 acres. It may be reached from Lyons, on the Chicago, Burlington, and Quincy Railroad; from Fort Collins, on the Union Pacific Railroad; from Loveland, on the Colorado and Southern Railway; and from Granby, on the Denver and Salt Lake Railroad. This park is only 50 miles northwest of Denver, and by reason of its accessibility it is destined to be one of the most popular of the national reservations. The well-known valley known as Estes Park is just east of this reservation, which includes Longs Peak and part of the main range of the Rocky Mountains. The park includes some of the finest scenic areas in Colorado.

The national parks have been established by act of Congress and placed under the supervision of the Secretary of the Interior, who makes the regulations necessary for their protection. The Secretary is assisted by a general superintendent and landscape engineer, and each park is in charge of a supervisor, who has under his control a number of rangers. Yellowstone Park is policed by troops of cavalry under the command of a line officer of the army, who is in charge of the park and who reports to the Secretary of the Interior on matters of civil administration and to the Secretary of War on matters of military discipline. The appropriations for the construction and sprinkling of roads in the Yellowstone Park and for the construction of roads in Crater Lake Park are made to the War Department, and this work is under the supervision of officers of the Engineer Corps of the army, who report directly to the Secretary of War. In the other parks all the employees are civilians. Until the spring of 1914 the Yosemite, Sequoia, and General Grant parks were policed by troops of cavalry, but the soldiers have been withdrawn from these parks, and all the work is done by rangers.

With the exception of the Hot Springs Reservation the parks are maintained by appropriations made each year by Congress. A separate appropriation is made for each park, the practice in this respect being radically different from that of Canada, which makes a lump appropriation for all the parks and allows the administration to spend the money where it is most needed. In addition to the appropriations the revenues from leases and other privileges are available for expenditure in all the parks with the exception of the Mesa Verde, Crater Lake, and Sullys Hill. The Hot Springs Reservation is maintained entirely from the revenues.

The government does not operate any hotels or transportation lines, all these functions being performed by individuals or corporations having a contract for a term of years or a license from year to year. The rates charged are subject to the approval of the Secretary of the Interior,

and all the concessioners pay for the privilege of operating in the parks.

The United States has been a pioneer in the establishment of national parks, but it has been closely followed by the Dominion of Canada, which is developing a fine system of national reservations. Similar reservations are practically unknown in European countries. As the country becomes more thickly settled, the wisdom of the policy of reserving these tracts of land becomes more and more apparent. What the city parks are to the municipalities the national parks are to the nation. They offer rest, recreation, and inspiration to thousands of people. In all of them the tourist is free to come and go as he will, subject only to the regulations designed to protect the natural curiosities, the forests, and the wild animals. Hunting is forbidden, but fishing is allowed with appropriate limitations on the size of the catch. Some parks have reached a high stage of development, and the tourist may select his means of transportation—he may proceed by coach, on horseback, or on foot; he may stop at hotels or permanent camps or may make his own camp. In portions of the parks the lack of roads and camps will compel the tourist to travel on horseback accompanied by a pack train.

The term "national parks" is generally understood to mean reservations which have been created because of their general interest and value and which are under the supervision of the Secretary of the Interior. Parks created for a special purpose, even if they are owned by the United States, are not regarded as national parks in the general use of this term, e.g., *National Zoological Park*, *Potomac Park*, and *Rock Creek Park* in the District of Columbia. These form part of the park system of the District of Columbia.

The Department of the Interior issues an annual report on each park and annual circulars giving data regarding hotels, camps, and places of interest in the larger and more important parks. The same department issues also a series of publications on the natural features of the parks. In 1914 the Secretary of the Interior appointed a landscape engineer and superintendent of national parks. Consult John Muir, *Our National Parks* (Boston, 1909), and E. F. Allen, *A Guide to the National Parks of America* (New York, 1915).

PARK, NATIONAL MILITARY. National military parks have been established by acts of Congress to preserve some of the famous battlefields of the War of the Rebellion as memorials and for purposes of historical and military study. These parks are under the general supervision of the Secretary of War and are managed by commissions appointed by him. *Chickamauga and Chattanooga National Military Park*, in Tennessee and Georgia, established by the Act of Aug. 19, 1890, has an area of 6966 acres. It includes Missionary Ridge and Look-out Mountain and the ground on which the battles of Chickamauga and Chattanooga were fought on Sept. 19–20 and Nov. 23–25, 1863, respectively. The commission in charge has its office at Chattanooga, Tenn. *Shiloh National Military Park*, in Tennessee, established by the Act of Dec. 27, 1894, has an area of 3546 acres. It includes the ground on which the battle of Shiloh was fought on April 6 and 7, 1862. The commission in charge has its office at Pittsburg Landing, Tenn. *Gettysburg National Military*

Park, in Pennsylvania, established by the Act of Feb. 11, 1895, has an area of 24,460 acres. It includes the ground on which the battle of Gettysburg was fought on July 1, 2, and 3, 1863. The commission in charge has its office at Gettysburg, Pa. *Vicksburg National Military Park*, in Mississippi, established by the Act of Feb. 21, 1899, has an area of 1323 acres. It includes the Confederate earthworks at Vicksburg and the positions occupied by the Union troops during the siege in April and May, 1863. The commission in charge has its office at Vicksburg, Miss. A portion of the battlefield at Antietam, Md., is owned by the United States, but the area does not have the status of a national military park; the tracts owned by the government are under the supervision of the quartermaster general of the army.

Pamphlets on the parks and the battles may be obtained from the various commissions at the addresses given above.

PARK, EDWARDS AMASA (1808–1900). An American theologian. He was born in Providence, R. I., Dec. 29, 1808. He graduated at Brown University in 1826, Andover Seminary in 1831, and was ordained as colleague pastor with Rev. Richard Salter Storrs, of Braintree, Mass., in the latter year. In 1835 he became professor of intellectual philosophy at Amherst College and the following year was called to Andover Theological Seminary as professor of sacred rhetoric. Nine years later he was transferred to the chair of systematic theology, succeeding the first incumbent, Rev. Dr. Leonard Woods. In this position Professor Park remained till he retired from active labor in 1881. He died June 4, 1900. Dr. Park was a famous preacher, but he was before all things else a teacher, and his influence from his lecture room was second to that of no man of his generation. In a sense he was the last of the New England theologians. (See *NEW ENGLAND THEOLOGY*.) His system may be defined in a phrase as that of the Westminster Confession, grounded upon a new philosophy and purged of its artificial and realistic details. His literary labors appeared chiefly in the *Bibliotheca Sacra*, which he continued to edit until 1884. He also published memoirs of Samuel Hopkins (Boston, 1854), Nathaniel Emmons (ib., 1861), and others, and a volume of *Discourses on Some Theological Doctrines as Related to the Religious Character* (Andover, 1885). Consult the memorial address by R. S. Storrs (New York, 1900), the volume in celebration of his ninetieth birthday (Boston, 1898), and *Memorial Collection of Sermons* (ib., 1902).

PARK, MUNGO (1771–1806). An eminent African explorer. He was born near Selkirk, in Scotland, was educated in Edinburgh University, and devoted his attention particularly to the study of surgery. In 1792 he went to the East Indies as a surgeon in the sea service of the East India Company. Returning from his first voyage, he offered his services as successor to Major Daniel Houghton, who had lost his life while searching for the Niger, to the African Association, which for half a century was the chief promoter of the exploration of Africa. Under its auspices, in 1795, at the age of 24, he went to the Gambia River with instructions to reach the Niger River and to ascertain its source, its course, and, if possible, its termination. After acquiring some knowledge of the Mandingo language he set out for the interior

in December, 1795, crossed the Senegal, and finally reached the Niger at Sego in July, 1796. He went down the river until he was within 15 days' travel of Timbuktu, which he could not reach on account of the tropical rains and because he had entered the country of merciless and fanatical Mohammedans. After having been in the interior for 19 months he returned home and wrote *Travels in the Interior of Africa* (1799; frequently reprinted).

The achievements of this solitary white man in inner Africa excited the widest interest. He had brought to light more important facts respecting the geography of western Africa than had any former traveler. By pointing out the positions of the sources of the Senegal and Gambia he showed where to look for the elevated parts of the country and for the water partings between the Gambia and Niger and between the fertile country and the desert. The success of his first journey induced the British government to employ him to complete the discovery of the course of the Niger. He received a captain's commission and was accompanied by his brother-in-law, Anderson, and 45 English soldiers, besides natives. He started into the interior in April, 1805. Of the white soldiers only three were of value to the expedition. Many died, and when the party embarked in canoes on the Niger to float down to its mouth, it had dwindled to seven men. Anderson died in October. Undaunted by his misfortunes, Park was resolved to find the mouth of the Niger. He sailed more than 1000 miles, but, entering a stretch of rapids below Yuri on the lower river, while both shores were lined with hostile natives, the boat was wrecked, and Park and his three surviving comrades were drowned. The journal he sent home and information obtained by later explorers give all the facts known about his last expedition. An "Account of the Life of Mungo Park," by Wishaw, was published in Park's *Journal of a Mission to the Interior of Africa* (1815).

PARK, ROSWELL (1852-1914). An American physician, born at Pomfret, Conn. He studied at Racine College and at Harvard University and in 1876 graduated in medicine at Northwestern University. During the following years he was interne at several hospitals and a member of the faculties of the Woman's Medical College (Chicago), Northwestern University, and Rush Medical College. In 1883 he was elected professor of surgery at the University of Buffalo, and afterward became surgeon to the Buffalo General Hospital and director of the State Pathological Laboratory at Buffalo. Park attended President McKinley after he had been shot in September, 1901, at the Pan-American Exposition. He served as president of the Medical Society of the State of New York and of the American Surgical Association (1900). His writings include: *Lectures on Surgical Pathology* (1891); *Text Book of Surgery* (1896); *History of Medicine* (1897); *Principles and Practice of Modern Surgery* (1907); *Selected Papers, Surgical and Scientific* (1914).

PARK CITY. A town in Knox Co., Tenn., near Knoxville, of which it is a residential suburb. Pop., 1910, 5126.

PARK CITY. A city in Summit Co., Utah, 35 miles by rail east-southeast of Salt Lake City, on the Union Pacific and the Denver and Rio Grande railroads (Map: Utah, C 2). It is in a rich silver and lead mining district, and

its chief mechanical industries are metallurgical. The water works are owned by the city. Park City was founded in 1874 and in 1898 was almost completely destroyed by fire. Pop., 1900, 3759; 1910, 3439.

PARK COLLEGE. A coeducational institution for higher education founded in 1875 at Parkville, Mo., through the efforts of Col. George F. Park and Rev. John A. McAfee. The buildings include Woodward Hall, a dormitory for boys, McCormick Chapel, the Mackay Building, the Charles Smith Scott Astronomical Observatory, Labor Hall, the Alumni Building, Waverly Hospital, and a number of dormitories and colleges. Most of the buildings on the campus were erected by student labor. The primary educational feature of the college is Christian training. It provides exceptional opportunities for young men without financial resources to secure for themselves a liberal education. A special student-help department is maintained, through which students may secure employment throughout the course. In addition to the college there is an academy which is under the same general management. The total enrollment in all departments of the college in 1914-15 was 420, and the faculty numbered 20. The endowment in 1914 amounted to \$489,320 and the value of the grounds, buildings, and equipment to \$394,684, the yearly income being about \$80,000. The library contains about 30,000 volumes. The president in 1915 was Arthur L. Wolfe.

PARKE, JOHN GRUBB (1827-1900). An American soldier, born in Chester Co., Pa. He graduated at West Point in 1849 and was assigned to the topographical engineers. From 1857 until the outbreak of the Civil War he was engaged in surveying the northwest boundary between the United States and what is now Canada. In 1861 he was commissioned brigadier general of volunteers and in 1862 was placed in command of one of the three brigades in Burnside's North Carolina expedition, during which he assisted at the capture of Roanoke Island (Feb. 8, 1862) and Newbern (March 14, 1862) and commanded at the capture of Fort Macon (April 26, 1862). For these services he was promoted major general of volunteers the same year and was made chief of staff of the Ninth Corps, with which he served at South Mountain (Sept. 14, 1862) and Antietam (Sept. 16-17, 1862). When his superior, General Burnside, was appointed commander of the Army of the Potomac, Parke remained his chief of staff until after the battle of Fredericksburg (Dec. 13, 1862). He accompanied the Ninth Corps into Kentucky the following March and commanded it before Vicksburg. At Jackson, Miss. (July 16, 1863), he commanded Sherman's left wing; his corps was ordered north, and he took part in the siege of Knoxville (Nov. 15-Dec. 5, 1863) and the pursuit of Longstreet into Virginia. He participated in the battles of the Wilderness and Spotsylvania. During the latter part of the Richmond campaign he again commanded the Ninth Corps, which he led at the capture of Petersburg and in the pursuit to Appomattox. He was mustered out of the volunteer service on Jan. 15, 1866, and returned to the northwest boundary survey. Subsequently he had charge of various military works and was superintendent of West Point from 1887 to 1889, when he retired from active service with the rank of colonel of engineers and the brevet of major

general in the regular army. He published *Compilations of Laws of the United States Relating to Public Works for the Improvement of Rivers and Harbors* (1877; rev. ed., 1887) and *Laws Relating to the Construction of Bridges over Navigable Waters* (1882; rev. ed., 1887).

PARKER, ALTON BROOKS (1852-). An American jurist and Democratic leader. He was born at Cortland, N. Y. It was his early intention to fit himself for a teacher, and under heavy difficulties he worked his way through the Cortland Normal School. Teaching, however, proved distasteful to him, and he entered the law office of Schoonmaker and Hardenburgh at Kingston, N. Y., and completed the course at the Albany Law School in 1873. In 1877 Parker was elected surrogate of Ulster County, and he held that position until 1885. He was a delegate to the Democratic National Convention in 1884 and in 1885 successfully managed the Democratic gubernatorial campaign. In 1886 he was appointed by Governor Hill to a vacancy in the Supreme Court and in the autumn of the same year was elected as the candidate of both parties for a full term. He was transferred to the Appellate Division of the Supreme Court in 1889 and was Chief Justice of the New York Court of Appeals in 1898-1904, when he resigned to accept the Democratic nomination for the presidency. When notified of his nomination he sent his famous "gold telegram" to the Democratic Convention, declaring for the gold standard. In the ensuing campaign he engaged in a controversy with Theodore Roosevelt over campaign contributions to the Republican party. After his defeat by Roosevelt he resumed the practice of law in New York City. He was temporary chairman of the Democratic National Convention in 1912 and was chief counsel for the managers in the impeachment trial of Gov. William Sulzer (q.v.) in 1913. In 1906-07 Parker was president of the American Bar Association and in 1914 presided over the New York State Bar Association.

PARKER, ARTHUR CASWELL (1881-). An American archaeologist, born at Iroquois, N. Y., and educated at Williamsport Dickinson Seminary (1898-1901), later making special studies in anthropology under Prof. F. W. Putnam (1901-03). He served as special assistant archaeologist at the American Museum of Natural History (1901-02), field archaeologist of the Peabody Museum (1903), and ethnologist of the New York State Department of Education (1904-06). In the latter year he became archaeologist of the New York State Museum. Parker published *Excavations in an Erie Indian Village* (1907) and *Iroquois Uses of Maize and Other Food Plants* (1910).

PARKER, EDWARD HARPER (1849-). An English Chinese scholar. From 1869 to 1871 he traveled in Mongolia. Thereafter until 1895 he was connected with the British consular service in the Far East, especially in China and Korea. In 1896 he was appointed reader in Chinese at University College, Liverpool, and in 1901 professor of Chinese at Victoria University, Manchester. His works include: *Comparative Chinese Family Law* (1879); *The Opium War* (1887); *Burma* (1893); *A Thousand Years of the Tartars* (1895); *John Chinaman* (1901); *China* (1901); *China Past and Present* (1903); *China and Religion* (1905); *Ancient China Simplified* (1908); *Studies in Chinese Religion* (1910).

PARKER, EDWIN WALLACE (1833-1901). An American Methodist Episcopal missionary bishop, born at St. Johnsbury, Vt. He was educated at the St. Johnsbury Academy and at the General Biblical Institute at Concord, N. H., joining the Vermont Conference of his denomination in 1857. In 1859 he sailed for India and spent the rest of his life there, becoming one of the great leaders in his field. He was several times presiding elder and was for several years superintendent of the Moradabad mission schools. In 1900 he was elected Missionary Bishop of Southern Asia. Consult J. H. Messmore, *The Life of Edwin Wallace Parker* (New York, 1903).

PARKER, FOXHALL ALEXANDER (1821-79). An American naval officer, born in New York City. He graduated at the Naval School in Philadelphia in 1843, served against the Florida Indians, and in 1850 became a lieutenant. In the Civil War he first commanded the gunboats *Mahaska* and *Wabash* and after 1863 the Potomac flotilla. In 1866 he was promoted captain and in 1872 commander. In 1873 he was chief signal officer of the navy and from 1878 until his death was superintendent of the Naval Academy at Annapolis. He published: *Fleet Tactics under Steam* (1863); *Squadron Tactics under Steam* (1863); *The Naval Howitzer Afloat* (1865); *The Naval Howitzer Ashore* (1865); *The Fleets of the World: The Galley Period* (1876); *The Battle of Mobile Bay* (1878).

PARKER, FRANCIS WAYLAND (1837-1902). An American educator, born at Bedford, N. H. He served throughout the Civil War, rising from private to colonel of the Fourth New Hampshire Volunteers. He was principal of a school in Manchester, N. H. (1865-68), and of one at Dayton, Ohio, from 1868 until 1872, when he went to Berlin to study psychology, philosophy, and pedagogy. Afterward he was school superintendent in Quincy, Mass. (1875-80), supervisor in Boston (1880-83), principal of Cook Co., Ill., Normal School (1883-96), and of the Chicago Normal School (1896-99). He was appointed president of the Chicago Institute in 1899. His publications include: *Talks on Teaching* (1883; 15th ed., 1903); *Practical Teacher* (1884); *Course in Arithmetic* (1884); *How to Study Geography* (1889; 3d ed., 1892).

PARKER, GEORGE HOWARD (1864-). An American zoölogist, born in Philadelphia. He graduated at Harvard University (S.B., 1887; S.D., 1891), and from 1891 to 1893 studied at Leipzig, Berlin, and Freiburg. While at Harvard he had taught zoölogy, and after his residence abroad he returned to his alma mater, becoming professor in 1906. A member of the National Academy of Sciences, in 1914 Parker was appointed by the President of the United States as a representative of the Academy on a special commission to examine and report on the condition of the fur seals in Alaska. He contributed frequently to zoölogical journals, mainly on the anatomy and physiology of sense organs and on animal reactions, and also published *Biology and Social Problems*, William Brewster Clark Lectures (1914).

PARKER, SIR (HORATIO) GILBERT (1862-). A British novelist and legislator. He was born in Camden East, Ontario, Canada, and was educated privately and at Trinity College, Toronto. He studied for admission to the ministry of the Church of England in Canada, of which he was ordained deacon in 1882, but in

1884 he began a journalistic and literary career. In 1885 he went to Australia, became associate editor of the *Sydney Herald*, and also wrote and adapted plays. After traveling extensively in Australasia he returned to Canada, but in 1897 settled in London, England. He first became widely known for his short stories and romances of Canadian life and character, exploiting a literary vein successfully attempted by William Kirby (q.v.), but after 1900 he devoted himself also to other themes, largely those concerned with British Imperial prospects and interests. In 1900 Parker was elected Conservative member for Gravesend in the Imperial House of Commons. The first Imperial Universities Conference in London in 1903 was due chiefly to his initiative. After the outbreak of the War in Europe in 1914, he wrote in behalf of the British cause. He was knighted in 1902 and in 1915 was made Baronet. His plays include: *The Vendetta* (1889); *No Defence* (1889); *The Seats of the Mighty* (1897). Besides these, a book of travels, *Round the Compass in Australia* (1892), and a volume of poems, *A Lover's Diary* (1894), he wrote: *Pierre and his People* (1892); *Mrs. Falchion* (1893); *The Trespasser* (1893); *The Translation of a Savage* (1894); *The Trail of the Sword* (1894); *When Valmond Came to Pontiac* (1895); *An Adventurer of the North* (1895); *The Seats of the Mighty* (1896); *The Pomp of the Lavilletes* (1897); *The Battle of the Strong* (1898); *The Lane that Had no Turning* (1900); *The Right of Way* (1901); *Donovan Pasha* (1902); *History of Old Quebec* (1903); *A Ladder of Swords* (1904); *The Weavers* (1907); *Northern Lights* (1909); *Cumner's Son* (1910); *The Land, the People, and the State* (1910); *The Judgment House* (1913); *You never Know your Luck* (1914); *The World in the Crucible* (1915), a book on the Great War.

PARKER, HERSCHEL CLIFFORD (1867-). An American physicist and mountain climber, born in Brooklyn, N. Y. He graduated in 1890 from the School of Mines of Columbia University, where he taught physics until 1911, having become professor in 1903. Between 1897 and 1903 he made explorations in the Canadian Alps and several first ascents, including Mounts Goodsir and Dawson (British Columbia) and Mounts Hungabee, Deltaform, Biddle, and Lefroy (Alberta). In 1906, 1910, and 1912 he explored the Mount McKinley region of Alaska, leading a successful expedition from the Alaskan coast to the summit, and in 1907 climbed Mount Olympus, Washington. On his first partial ascent of Mount McKinley he was accompanied by Frederick A. Cook (q.v.), whose contention that he had attained the summit of that mountain Parker was instrumental in refuting in 1909 and 1910, when suspicions were aroused concerning the validity of Cook's claim to have discovered the North Pole. Parker became a member of numerous scientific and alpine societies. He made his home in Brooklyn. Besides various articles on mountaineering and on incandescent electric lighting (a field in which he did research work in 1903-07), he is author of *A Systematic Treatise on Electrical Measurements* (1897).

PARKER, HORATIO WILLIAM (1863-). An American composer and teacher. He was born at Auburndale, Mass., and was a pupil first of his mother, then of George W. Chadwick and Stephen A. Emery, and subsequently of the

Munich Conservatory, where he graduated in 1885. After returning to America he became organist of the Garden City Cathedral, Long Island, and professor of music at the Cathedral School. In 1886 he was organist and choir-master at St. Andrew's, New York, and two years later went to Trinity Church, Boston. He became professor of music at Yale University in 1894, in the same year founding the New Haven Symphony Orchestra. Parker was chosen a member of the American Academy of Arts and Letters. His oratorio, *Hora Novissima* (1893), has been called by European critics one of the finest of American compositions, and, as in the case of Elgar (q.v.), none of his subsequent works measure up to the composition that made him famous. In 1911, with Brian Hooker (q.v.), who wrote the libretto, he won a \$10,000 prize in a contest instituted by the Metropolitan Opera House, the successful opera *Mona* being produced the following year. Once more, with Hooker, he carried off a \$10,000 prize with the opera *Fairyland*, produced in 1915 in Los Angeles as part of a municipal anniversary celebration. For the centennial celebration of the foundation of the Handel and Haydn Society of Boston Parker wrote his third oratorio, *Morven and the Grail* (1915). His other works include a symphony in C; a concert overture in E flat, and two overtures, *Regulus* and *Count Robert of Paris*; a concerto for organ, harp, and orchestra; the oratorio *St. Christopher* (1896); the choral works with orchestra: *The Ballad of the Knight and his Daughter* (1884), *King Trojan* (1885), *Der Normannenzug* (1889), *The Holy Child* (1890), *The Kobolds* and *Harold Harfagar* (1891), *The Dream King* (1893), *A Wanderer's Psalm* (1900), *A Star Song* (1901); *The Leap of Roushan Bey* (1914); pieces for piano and organ; songs; chamber music.

PARKER, SIR HYDE (1739-1807). A British admiral, son of a vice admiral under whom he first served. He was knighted in 1779 for his success three years before in occupying the North River (the Hudson being so named for a short distance from its mouth), which was strongly fortified by the Revolutionary forces. He served through the Revolutionary War, was appointed commander in chief at Jamaica in 1796, and in January, 1801, was sent into the Baltic to terrorize Denmark. His second in command, Lord Nelson, urged bolder action than seemed good to Parker, and in the battle off Copenhagen took command in the lighter vessels because of the shallow channel and refused to obey the order to retreat issued by Parker, who was loath to infringe the customary rules of naval warfare. Parker was soon replaced by Nelson and saw no further service.

PARKER, JOEL (1795-1875). An American jurist, born at Jaffrey, N. H. He graduated at Dartmouth College in 1811 and, after studying law, practiced at Keene. He was appointed an associate justice of the Supreme Court of New Hampshire in 1833 and was chief justice in 1838-48. In 1840 he was chairman of the committee on the revision of the State statutes, professor of medical jurisprudence at Dartmouth in 1847-57, and in 1847-75 professor of law at Harvard. Conservative in politics, he opposed during the Civil War the exercise by the President of what he deemed unconstitutional powers. His publications include: *Non-Extension of Slavery* (1856); *Personal Liberty Laws* (1861);

The Right of Secession (1861); *Constitutional Law* (1862); *The War Powers of Congress and of the President* (1863); *Revolution and Reconstruction* (1866); *Conflict of Decisions* (1875).

PARKER, JOEL (1799-1873). An American Presbyterian minister and educator, born at Bethel, Vt. After graduating from Hamilton College in 1824, he studied at Auburn Theological Seminary and in 1827 was ordained to the ministry. He was pastor at Rochester, N. Y. (1826-30), organized and was pastor (1830-33) of the Dey Street Presbyterian Church, New York City, and held charges in New Orleans (1833-38) and New York (Broadway Tabernacle, 1838-40). From 1840 to 1842 Dr. Parker was the second president of Union Theological Seminary and its first professor of sacred rhetoric. Subsequently he occupied pulpits in Philadelphia (1842-52), New York City (1852-62), and Newark, N. J. (1862-68). His writings include: *Lectures on Unitarianism* (1829); *Morals for a Young Student* (1832); *Invitation to True Happiness* (1843); *Reasonings of a Pastor* (1849); *Sermons* (1852); *Pastor's Initiatory Catechism* (1855).

PARKER, JOEL (1816-88). An American statesman, born near Freehold, N. J. He graduated at Princeton in 1839 and in 1842 was admitted to the bar. In 1847 he was elected to the New Jersey Legislature and in 1852-57 was prosecuting attorney. At the outbreak of the Civil War he was appointed a major general of militia and devoted himself to the work of enlisting volunteers. The next year (1862) he was elected Governor by an unprecedented majority, for, though a Democrat and opposed to the Abolitionists, he was a strong Union man. So energetic and successful was he in raising troops that the draft was never applied in New Jersey, and during Lee's invasion of Pennsylvania in 1863 he induced several recently returned regiments to go again to the front, thereby earning the thanks of that State. Equally successful was his financial policy, for during his administration the State bonds never sold below par, and the adoption of his plan for wiping out the war debt resulted in its being paid off without special taxation. Parker, though a firm supporter of the North, urged a grant of amnesty to all who had been in arms against the Federal government. At the end of his term as Governor, in 1866, he retired to private life, but in 1871 was reelected. In 1875 he was appointed Attorney-General and in 1880-88 was an associate justice of the New Jersey Supreme Court.

PARKER, JOSEPH (1830-1902). An English Congregational clergyman. He was born at Hexham, Northumberland. He had little training in the schools, but read much. In 1852 he attended classes at University College, London. In 1853 he became pastor of the Congregational Chapel at Banbury and remained five years, when he was called to the Cavendish Street Chapel, Manchester. He at first declined on account of a debt contracted in building a new church at Banbury; but the Manchester people assumed the debt, and the transfer was effected. In 1869 he left Manchester and went to London to preach at the Old Poultry Chapel, Cheapside. Here his success was so great that the chapel became inadequate for the congregations, and in 1874 the City Temple on Holborn Viaduct was opened. He continued pastor of the church until his death at his home in Hampstead. His

eccentricities did not always secure public approbation, but he was surrounded by enthusiastic admirers who turned the edge of public criticism. He was twice chairman of the London Congregational Board and twice of the Congregational Union of London and Wales. In 1887 he visited America and delivered a eulogy on his friend Henry Ward Beecher. His published works include: *Ecce Deus: Essays on the Life and Doctrine of Jesus Christ* (1868), a reply to *Ecce Homo; The Paraclete* (1874); *The People's Bible* (25 vols., 1885 et seq.); *People's Prayer Book* (1898); *Paterson's Parish* (1898). Works of an autobiographical nature are: *Springdale Abbey: Extracts from the Letters and Diaries of an English Preacher* (1869); *Tyne Chylde: My Life and Ministry, partly in the Daylight of Fact, partly in the Limelight of Fancy* (1883); *A Preacher's Life: An Autobiography and an Album* (1899). Consult William Adamson, *Life of Joseph Parker* (New York, 1903).

PARKER, LAWTON S. (1868-). An American portrait painter. He was born at Fairfield, Mich., studied at the Art Institute, Chicago, in New York under Chase, and, after winning the Chanler scholarship in 1896, in Paris under Gérôme, Laurens, Constant, Benaud, and Whistler. Parker divided his time between America and France. In 1898-99 he was president of the New York School of Art, in 1900 director of the Parker Academy in Paris, and in 1903 president of the Chicago Academy. An able technician, his portraits are strong and well characterized. Among his sitters were Martin A. Ryerson, J. Ogden Armour, Harry P. Judson, N. W. Harris, Judge Grosscup, and Judge J. G. Jenkins. He also painted nudes and plain-air studies. He was the first American to receive a gold medal at the Paris Salon (1913); he also received a gold medal in Munich (1905), the Cohn prize at Chicago (1908), and a medal of honor at the Panama-Pacific Exposition (1915).

PARKER, LINUS (1829-85). An American bishop of the Methodist Episcopal Church South. He was born near Vienna, Oneida Co., N. Y. When 16 years old, he left home to make his fortune and went to New Orleans. At Mandeville College near this city he was for a time a student. Parker served in the Mexican War, then studied law, but finally entered the ministry in 1849. Editor of the *New Orleans Christian Advocate* from 1870 to 1882, in the latter year he was elected Bishop. He was a member of the General Conferences of 1874, 1878, and 1882. Consult C. B. Galloway, *Linus Parker: His Life and Writings* (Nashville, 1886).

PARKER, LOUIS NAPOLEON (1852-). An English dramatist, also a composer. He was born at Calvados, France, and was educated at Freiburg im Breisgau and at the Royal Academy of Music, London, of which he became a fellow in 1898. From 1877 to 1896 he was director of music in Sherborne School. He was responsible as author, collaborator, or translator for many successful plays. These include: *A Buried Talent* (1890); *Rosemary* (1896); *The Ter-magant* (1898); *Cyrano de Bergerac* (1900); *Beauty and the Barge* (1904); *The Duel* (1907); *Beethoven* (1909); *Pomander Walk* (1910); *Chantecler* (1911), from the French of Ros-tand; *Sire* (1911); *Disraeli* (1911); *The Lady of Coventry* (1911); *Drake* (1912); *The Paper Chase* (1912); *Joseph and his Brethren* (1913);

The Highway of Life (1914), played in London as *David Copperfield*. Parker's work is of especially high quality in *Pomander Walk*, one of the most delightful of comedies; in *Disraeli*, which, as played by George Arliss, was a great success; in *Drake*; and in *Joseph and his Brethren*, of spectacular type but powerfully dramatic.

PARKER, MATTHEW (1504-75). Archbishop of Canterbury. He was born at Norwich, Aug. 6, 1504, studied at Corpus Christi College, Cambridge, and was ordained a priest in 1527. At the university he was a distinguished student and was from an early period favorably disposed towards the doctrines of the Reformation and lived in close intimacy with some of the more ardent reformers. In 1535 he was appointed chaplain to Queen Anne Boleyn. With this appointment he obtained the deanery of the monastic college of Stoke-by-Clare in Suffolk. Here he appears to have first definitely sided with the reforming party in the church and state, the sermons which he preached containing bold attacks on different Catholic tenets and practices. In 1538 Parker took the degree of D.D., and in 1544, after some minor changes, became master of Corpus Christi College, Cambridge, which he ruled admirably. Three years later he married and probably about this time drew up his defense of the marriage of priests, entitled *De Conjugio Sacerdotum*. In 1552 he was presented by King Edward VI to the rich deanery of Lincoln. On the accession of Queen Mary he refused to conform to the reestablished order of things and was deprived of his preferments and even obliged to conceal himself. It does not appear, however, that he was eagerly sought after by the emissaries of Mary, for he was very unwilling to disturb the framework of the church. On the death of Mary and the accession of Elizabeth (1558) he was appointed by the Queen Archbishop of Canterbury. The consecration took place in Lambeth Chapel, Dec. 17, 1559.

The subsequent history of Archbishop Parker is that of the Church of England. The difficulties that beset him were very great. Elizabeth herself was addicted to various "popish" practices, such as the use of images, and was strongly in favor of the celibacy of the clergy. Parker's greatest anxiety was in regard to the spirit of sectarian dissension within the bosom of the church itself. Already the germs of Puritanism were beginning to spring up, and there can be no doubt that their growth was fostered by the despotic caprices of the Queen. Parker himself was manifestly convinced that, if ever the Reformation was to be firmly established in the land at all, some definite ecclesiastical forms and methods must be sanctioned to secure the triumph of order over anarchy, and he vigorously set about the repression of what he thought a mutinous individualism incompatible with a catholic spirit. That he always acted wisely or well cannot be affirmed; he was forced into intolerant and inquisitorial courses, and as he grew older he grew harsher, the conservative spirit increasing with his years. Though favoring the Reformation, he was moderate and cared more to keep the church united than to lead it on to further advances. He gave the English people the "Bishops' Bible," which was undertaken at his request, prepared under his supervision, and published at his expense in 1572. Much of his time and labor

from 1563 to 1568 was given to this work. He had also the principal share in drawing up the *Book of Common Prayer*, for which his skill in ancient liturgies peculiarly fitted him, and it was under his presidency that the *Thirty-nine Articles* were finally reviewed and subscribed by the clergy (1562). Parker died in the palace at Lambeth, London, May 17, 1575.

Among other works, Parker published in 1567 an old *Saxon Homily on the Sacrament*, by Ælfric of St. Albans, *A Testimonie of Antiquitie Showing the Auncient Fayth in the Church of England Touching the Sacrament of the Body and Bloude of the Lord*, to prove that transubstantiation was not the doctrine of the ancient English church; edited (1571) the histories of Matthew of Westminster and Matthew Paris; and superintended the publication of a most valuable work, *De Antiquitate Britannicæ Ecclesiæ*, probably printed at Lambeth in 1572, where the Archbishop, we are told, had an establishment of printers, engravers, and illuminators. He also founded the Society of Antiquaries and was its first president; endowed the University of Cambridge and particularly his own college with many fellowships and scholarships and with a magnificent collection of manuscripts relating to the civil and ecclesiastical condition of England and belonging to nine different centuries (from the eighth to the sixteenth). His correspondence from 1535 on was published by the Parker Society (Cambridge, 1853). Consult his *Life* by Strype (best ed., 3 vols., Oxford, 1821), and in Hook's *Archbishops of Canterbury*, vol. iv (N. S., London, 1872); also W. M. Kennedy, *Archbishop Parker* (ib., 1908). In his honor the Parker Society was formed, which published 56 volumes of Elizabethan ecclesiastical literature (Cambridge, 1841-54).

PARKER, SIR PETER (1721-1811). A British naval officer, born probably in Ireland. He entered the navy and became lieutenant in 1743 and captain in 1747. He served in the West Indies and took part in the capture of Belle-Isle in 1761. For 10 years he was out of the service on account of the reduction of the navy. He was knighted in 1772, rejoined the service in 1773, and in October, 1775, with a small squadron, was sent to cooperate with Sir Henry Clinton in the reduction of the Southern Colonies of America. The attempt of Josiah Martin (q.v.) to arouse the Tories of North Carolina failed, and Parker proceeded to Charleston and made the unsuccessful attack on Fort Moultrie, June 28, 1776. He aided Lord Howe in the capture of New York in September and commanded the squadron which afterward took possession of Rhode Island. In April, 1777, he was promoted to rear admiral and placed in charge of Jamaica in 1778. He became vice admiral in 1779, was made Baronet when he returned to England in 1782, and became admiral in 1787. From 1793 to 1799 he was commander in chief at Portsmouth and succeeded Lord Howe as admiral of the fleet. He is perhaps best remembered as the friend and patron of Nelson.

PARKER, PETER (1804-88). An American medical missionary and diplomat. He was born in Framingham, Mass., graduated at Yale College in 1831, studied theology and medicine at New Haven, and after receiving his M.D. and being ordained to the Congregational ministry went to China as a missionary in 1834. He estab-

lished a hospital at Canton, principally for eye diseases, but soon widened in scope. Dr. Parker possessed great surgical skill, and his fame spread rapidly. War breaking out in 1840 between England and China, the hospital was closed, and Dr. Parker returned to the United States. In 1842 he went back to China and reopened the hospital. In 1845 he resigned his connection with the American Board of Commissioners for Foreign Missions, and became secretary to the United States Legation and interpreter of the new embassy, still having charge of the hospital. In the absence of the Minister he acted as *chargé d'affaires*. In 1855, his health having failed, he again visited the United States, but by request of the government he returned the same year to China as commissioner with full power to revise the Treaty of 1844. This position he held until a change of administration in 1857, when, his health again failing, he returned to the United States and settled in Washington. He became a regent of the Smithsonian Institution in 1868. Parker published: *Reports of the Ophthalmic Hospital at Canton (1836-52)*; *Statements Respecting Hospitals in China (1841)*; *Notes of Surgical Practice amongst the Chinese (1846)*.

PARKER, QUANA. See QUANA PARKER.

PARKER, THEODORE (1810-60). An American preacher, scholar, and reformer. He was born in Lexington, Mass., Aug. 24, 1810. His father was farmer and mechanic, and the son shared actively in his occupations in the intervals of study at the district school and Lexington Academy. He entered Harvard College in 1830 and took the full course of study privately, passing all the examinations, but getting no A.B. degree because he had paid no tuition fees. In 1840 the degree of A.M. was given him. By that time he had mastered several languages which the college did not teach. In 1833 he entered the Harvard Divinity School, from which he graduated in 1836. He was ordained June 21, 1837, and the same day installed pastor of the West Roxbury Unitarian Church. May 19, 1841, he preached in South Boston an ordination sermon, "The Transient and Permanent in Christianity," which attracted much attention and elicited violent opposition. With Channing's "Baltimore Sermon" of 1819 and Emerson's Divinity School Address of 1838, it is accounted one of the three epoch-making sermons of the Unitarian development. It was virtually a rejoinder to Andrews Norton's "Latest Form of Infidelity," which, replying to Emerson's address, contended that no man can be a Christian who accepts the teachings of Jesus for any other reason than that of their miraculous attestation. The sermon did not deny the miraculous in Christianity, but men's present need of it. Invited to preach in Boston, his first important sermons were gathered into a book, *A Discourse on Matters Pertaining to Religion (1842)*, which increased the controversial heat. There were Unitarians who wished formally to expel him from their fellowship and did achieve his virtual exclusion when most of the ministers refused to fellowship with him in church relations. In 1846 the Twenty-eighth Congregational Society was formed in Boston, and he became its minister, preaching in the Melodeon until 1852, and for the next seven years to a congregation of several thousands in Music Hall. To much controversial preaching he added more of the kind represented by his

Lessons from the World of Matter and the World of Man (1865). He had inherited a tendency to consumption and in January, 1859, was attacked with severe illness. He was taken to Santa Cruz and there wrote his *Experience as a Minister (1859)*. From Santa Cruz he went to England and thence to Italy and died, May 10, 1860, at Florence, where he is buried in the Protestant Cemetery. Theodore Parker's Christianity was antisupeatural; his philosophy intuitional, transcendental; his theology theistic, affirming God, the moral law, and immortality as certainties of consciousness. His conception of Jesus was purely humanitarian, and his criticism of the Bible anticipated the results of more recent orthodox scholarship. He was one of the most conspicuous leaders of the New England Abolitionists, uniting a great personal admiration for Garrison with some differences from his views and aims.

Bibliography. His works have been published collectively (edited by Frances Power Cobbe, 14 vols., London, 1863-70; 10 vols., Boston, 1870; and, with additions, in the centenary edition, 15 vols., Boston, 1907). Consult also his *Historic Americans (Boston, 1870)*; *Discourse on Matters Pertaining to Religion*, with introduction by Hannah E. Stevenson (New York, 1871); *Prayers*, with memoir by F. B. Sanborn (Boston, 1882); *Views of Religion*, with introduction by James Freeman Clark (ib., 1885); *West Roxbury Sermons (ib., 1892)*; *Transient and Permanent in Religion (ib., 1908)*; *Rights of Man in America*, edited by F. B. Sanborn (Boston, 1911). Also his *Autobiography* (centenary edition, Boston, 1910); and John Weiss, *Life and Correspondence of Theodore Parker (New York, 1864)*; J. W. Chadwick, *Theodore Parker (Boston, 1908)*; F. B. Sanborn, "Theodore Parker and Emerson," in *Recollections of Seventy Years*, vol. ii (ib., 1909).

PARKER, THOMAS JEFFERY (1850-98). A British zoologist, born in London, a son of William Kitchen Parker (q.v.). He received his education in the Royal School of Mines and in the University of London. From 1872 to 1880 he was demonstrator under Huxley at South Kensington and lecturer in biology in Bedford College, London. In 1880 he became professor of biology in the University of Otago, Dunedin, New Zealand. He published a number of memoirs on New Zealand animals, important of which are: *On the Structure and Development of Apteryx* and *On the Cranial Osteology, Classification, and Phylogeny of the Dinornithidae*. He also wrote the following textbooks, in which great literary and artistic ability are joined with extensive knowledge and pedagogical skill: *Zootomy (1884)*; *Lessons in Elementary Biology (1890)*; *A Text-Book of Zoology (1897)*, with W. A. Haswell. The last named is the guide followed in the classification of animals in this ENCYCLOPÆDIA. Professor Parker died at Warrington, New Zealand, Nov. 7, 1898.

PARKER, WILLARD (1800-84). An American surgeon, born at Hillsborough, N. H. He graduated from Harvard in 1826 and from its Medical School in 1830, when he was made professor of anatomy in Vermont Medical College and in the same year professor of anatomy in the Berkshire Medical College, in which latter institution he became professor of surgery in 1833, holding the post till 1836, when he removed to Cincinnati. In 1837 he spent several months in the hospitals of London and Paris.

Upon his return he settled in New York City, where he was appointed professor of surgery at the College of Physicians and Surgeons; this post he occupied for 30 years. He then became professor of clinical surgery. In 1854 he first described and reported cases of what is now known as malignant pustule. In 1865 he was made president of the New York State Inebriate Asylum at Binghamton and in 1867 a member of the Metropolitan Board of Health. He was the first to point out the phenomenon of concussion of the nerves as distinguished from that of the nerve centres, a condition which had previously been confounded with congestion or inflammation. Dr. Parker made several important discoveries in practical surgery, among which were the operation of cystotomy for the relief of certain cases of chronic cystitis and that for the cure of abscess near the vermiform appendix, called at that time perityphlitis.

PARKER, SIR WILLIAM (1781-1866). An English admiral, born at Alington Hall, Staffordshire. He went to sea when 12 years old on the *Orion*, which shared in Lord Howe's victorious engagement with the French fleet in 1794. He was promoted to be lieutenant in 1799 and commander the same year. As commander of the *Amazon* he was engaged in arduous service on the Portuguese and Spanish coasts and made a notable capture of the French frigate *Belle Poule* (1806). As captain of the *Warspite* he was senior officer on the Grecian coast in 1828. He was made a rear admiral in 1830 and was knighted in 1834 for his services aboard the flagship *Asia* during the three preceding years. He remained in England as an Admiralty lord until 1841, when he was made vice admiral in command in the East Indies, and his prompt action in capturing the ports and blockading the mouth of the Grand Canal brought the Chinese war to an end in 1842. On his return to England in 1844 he was made Baronet. In 1845-52 he was commander in chief in the Mediterranean, and in 1857 he retired. He was created admiral of the fleet in 1863. He had great influence on the navy as a strict though discriminating disciplinarian, and he was often consulted by the Admiralty lords on questions of naval policy. It was mainly through his efforts that the system of continuous service was adopted.

PARKER, WILLIAM BELMONT (1871-). An American editor. He was born at Hasbury, England, and graduated from Harvard in 1897. After four years as assistant editor of the *Atlantic Monthly* he served as literary adviser or editor with Houghton, Mifflin, and Company (1902-04), the Associated Sunday Magazines (1906-08), the *World's Work* (1908), the Baker and Taylor Company (1909-12), and the Century Company (1912). Between 1904 and 1908 he taught English at Harvard and Columbia. In 1912 Parker became business manager of the *Churchman*. He edited Lowell's *Anti-Slavery Papers* (1903), Sir Philip Sidney's *Certain Sonets* (1904), and *Complete Poems of Edward Rowland Sill* (1906); was joint editor of the *Letters and Addresses of Thomas Jefferson* (1905); wrote *Edward Rowland Sill: His Life and Work* (1915); and contributed to magazines.

PARKER, WILLIAM KITCHEN (1823-90). An English naturalist and morphologist, born at Dogsthorpe, near Peterborough. He studied medicine at King's College, London, and began to practice in 1849. In 1873 he was appointed

Hunterian professor of comparative anatomy in the Royal College of Surgeons, conjointly with Prof. W. H. Flower. His chief and most suggestive work was on the comparative osteology of the higher vertebrates, from amphibian to mammal. He constantly dwelt on the developmental side and on the phylogeny of the vertebrates, making many improvements in the classification of the types he studied. His larger monographs were: *Monograph on the Structure and Development of the Shoulder-Girdle and Sternum in the Vertebrata* (1868), and memoirs on the skull of the Batrachia (1878 and 1880), the urodelous Amphibia (1877), the common snake (1878), sturgeon (1882), *Lepidosteus* (1882), *Edentata* (1886), *Insectivora* (1886), and an elaborate paper on the development of the wing of the common fowl (1869). His general works were *Morphology of the Skull* (1877) and *On Mammalian Descent* (1885). He was the father of Thomas Jeffery Parker.

PARKERSBURG. A city and the county seat of Wood Co., W. Va., 94 miles southwest of Wheeling, on the Ohio River, at the mouth of the Little Kanawha, and on the Baltimore and Ohio, the Baltimore and Ohio Southwestern, and the Little Kanawha railroads (Map: West Virginia, C 2). The city rises gradually from the water's edge, the limits extending for some distance on both rivers. A railroad bridge spans the Ohio at this point, 1¼ miles long, and two others span the Kanawha, all being imposing examples of engineering. The city has a fine public park, Carnegie library, Washington High School, Academy of the Visitation Federal building, courthouse, city hall, and Logan Children's Home. Blennerhasset Island and Fort Boreman, both of historic interest, are in sight of the city. There are regular steamboat lines to important river ports. The city is favorably located in the centre of a fertile agricultural region and has an active trade. There are several noted medicinal springs near the city, petroleum and gas wells, and coal and clay deposits of great value. The industrial interests are extensive. There are lumber mills, iron foundries, manufactories of boilers, gas engines, shovels, steamboats, bottles, vitrolite glass, and paving blocks, machine shops, furniture and chair factories, oil refineries, veneer and panel works, oil-well-supply works, flouring mills, etc. Settled in 1773, Parkersburg was first incorporated in 1820 and in 1863 was chartered as a city. In 1911 the commission form of government was adopted. The water works are owned and operated by the municipality. Pop., 1900, 11,703; 1910, 17,842; 1914 (U. S. est.), 19,719.

PARKES, PARKS, SIR HARRY SMITH (1828-85). A British diplomatist, born in the Parish of Bloxwich, near Walsall, in Staffordshire, England. Left an orphan in tender years, he was educated at King Edward's Grammar School, Birmingham. In 1841 he went to Macao, China. By his energy and diligence he rose to be British Consul at Canton. On Oct. 8, 1856, the Chinese seized the British ship *Arrow*, taking therefrom 12 Chinese sailors. Parkes's vigorous protest and Mandarin Yeh's defiant refusal to make amends led, in December, 1857, to the bombardment and occupation of Canton by the British forces, who were aided by the French. In July, 1860, Parkes joined Lord Elgin in the Anglo-French punitive expedition to north China. After the capture of Tientsin, August 24,

Parkes, with 25 men, proceeding to Tungchow under a flag of truce, was captured and imprisoned. Though suffering torture, he sent word to his chief to make no delay or compromise and to take no account of him. The allies arrived in Peking October 6, and half of the prisoners—those not already murdered or starved—were delivered up October 9; but, in punishment of the government's treachery, the Emperor's summer palace was pillaged and destroyed. Parkes was knighted in 1862, became Consul at Shanghai, and in 1865 was appointed British Minister to Japan. For 18 years in this office he enjoyed extraordinary popularity with his countrymen and was always a stalwart upholder of British interests. He was a powerful element in the modern history of Japan, fearless, truthful, and a despiser of the shams and hypocrisies which marked the old school of Japanese statesmanship. In 1882 he was made G. C. M. G. He was appointed Minister to China in 1883 to succeed Sir Thomas F. Wade, and in the following year he also became Minister to Korea. He visited Seoul and negotiated a treaty there; but after the Tongking question and diplomacy, in which "he fired out the Tsung-li Yamen" (q.v.), he died of overwork, March 22, 1885. He was buried at Whitechurch in England. A marble bust of Parkes was unveiled in 1887 by Sir Rutherford Alcock in St Paul's Cathedral in London, and in April, 1890, his was the first public statue unveiled in Shanghai. Consult his *Life*, by Stanley Lane-Poole (London, 1894).

PARKES, SIR HENRY (1815-96). An Australian statesman. He was born at Stoneleigh in Warwickshire, England, was compelled by his father's poverty to earn his own living from the time he was 11 years old, and was entirely self-educated. When 24 years old, he emigrated to Australia, and for some years worked as a farm laborer in New South Wales. He became noted as a political agitator on the side of the Anti-Transportation of Convicts party; founded the *Empire*, a Liberal journal, towards the close of 1850; was elected to the New South Wales Parliament in 1856, and thereafter became identified with the national history of Australia. After holding ministerial rank in Sir James Martin's cabinet he formed, in 1872, his own first administration, holding the post of Premier during five separate governments, the last terminating in 1891, in which year he consummated, as President of the National Convention held at Sydney, the great work of his life, viz., the federation of the various states of Australia and Tasmania—an accomplished fact within a decade afterward. (See AUSTRALIAN FEDERATION.) The most important of his books are: *Australian Views of England* (1869); *Federal Government in Australia* (1890); *Fifty Years in the Making of Australian History* (his autobiography, 1892); *An Emigrant's Home Letters* (1897). Consult C. E. Lync, *Life of Sir Henry Parkes* (London, 1897).

PARKESBURG, pärks'bürg. A borough in Chester Co., Pa., 45 miles west of Philadelphia, on the Pennsylvania Railroad (Map: Pennsylvania, K 8). It has large greenhouses, iron and chemical works, a planing mill, and flour mills. The surrounding country is adapted to farming and dairying. Pop., 1900, 1788; 1910, 2522.

PARKHURST, CHARLES (1845-). An American Methodist Episcopal clergyman and

editor, born at Sharon, Vt. He graduated from Dartmouth College in 1878 and studied for a time at Andover Theological Seminary. He had already held several pastorates and continued to fill pulpits in Vermont, New Hampshire, and Massachusetts until 1888, when he was elected editor of *Zion's Herald* of Boston.

PARKHURST, CHARLES HENRY (1842-). An American Presbyterian clergyman and social reformer. He was born at Framingham, Mass., graduated from Amherst College in 1866, and for two years was principal of the Amherst High School. Theology he studied at Halle (1869-70) and at Leipzig (1872-73), periods separated by teaching at Williston Seminary. In 1874 he became pastor of the Congregational Church at Lenox, Mass., and in 1880 was called to the Madison Square Presbyterian Church, New York. Notably effective as a preacher, even when in his seventies, Dr. Parkhurst had early attracted attention by sermons practical, terse, and fearless. He was as well known, however, for his work in the furtherance of civic and social righteousness. In 1891 he was made president of the Society for the Prevention of Crime. Subsequently the investigations made by this society into the conditions of vice existing in New York City under police protection resulted (1894) in the appointment by the State Senate of the Lexow Committee (See LEXOW, CLARENCE.) In 1915 the Presbyterian General Assembly, misinterpreting a statement Dr. Parkhurst had made regarding prohibition, censured him in his absence and without discussion. From Amherst, of which he served as trustee from 1892 to 1902, he received the degrees of D.D. and LL.D. Besides contributions to the periodical press, he published: *Forms of the Latin Verb Illustrated by the Sanskrit* (1870); *The Blind Man's Creed, and Other Sermons* (1883); *The Pattern on the Mount, and Other Sermons* (1885); *The Question of the Hour* (1886); *The Fellowship of Suffering* (1891); *Our Fight with Tammany* (1895); *Talks to Young Men and Talks to Young Women* (1897); *Guarding the Cross with Krupp Guns* (1900); *The Sunny Side of Christianity* (1901); *A Little Lower than the Angels* (1908); *The Pulpit and the Pew*, Yale Lectures on Preaching (1913).

PARKHURST, JOHN (1728-97). An English Bible scholar. He was educated at Rugby and Clare Hall, Cambridge, and took orders, but received no preferment, spending his life in retirement and study. He published a *Hebrew and English Lexicon* (1762), to which he added in later editions a Hebrew grammar and a Chaldee grammar; a *Greek and English Lexicon to the New Testament*, with a Greek grammar (1769); and treatises against Wesley's doctrine of assurance (1753) and Priestley's views concerning the divinity and preëxistence of Jesus Christ (1787). Parkhurst's lexicons had much merit, but were marred by fantastic theories which he adopted from John Hutchinson the English theologian (q.v.), who held that the Hebrew Bible contained the elements of all philosophical truth. The edition of his Hebrew lexicon published in 1823 contains his life.

PARKIN, GEORGE ROBERT (1846-). A Canadian educator and author. He was born at Salisbury, New Brunswick, and was educated at the University of New Brunswick and later at Oxford University, England. He was prin-

cial of the College School at Fredericton for several years and began to take an active interest in the "Imperial federation" question, upon which subject he spoke in various parts of the Empire. In 1895-1902 he was principal of Upper Canada College, Toronto. Afterward he was made organizing representative of the scholarship trust founded by the will of Cecil Rhodes (q.v.). His publications include: *Imperial Federation* (1892); *Round the Empire* (1892); *The Great Dominion* (1895); *Life and Letters of Edward Thring* (1898); *Life of Sir John A. Macdonald* (1906); *The Rhodes Scholarships* (1912).

PARKINSON, JAMES (1755-1824). An English physician and paleontologist. He studied medicine under John Hunter and practiced in Hoxton from about 1785. Parkinson was a fellow of the Royal College of Surgeons and one of the original members of the Geological Society of London (1807). He also took an active part in politics, was a radical and a reformer and opposed to the government's policies, and besides he was greatly interested in geology and paleontology. In all these fields he was an author. Among the more important of his writings are his report on a case of appendicitis, which was the first article (1812) on the subject in English, and also the first in which perforation was recognized as the cause of death; *Mad-houses* (1811), his report on insane asylums and suggestions for correcting the poor condition of these institutions; his classic description of paralysis agitans (Parkinson's disease) in *An Essay on the Shaking Palsy* (1817); *Organic Remains of a Former World* (3 vols., 1804, 1808, 1811; new ed., 3 vols., 1833) and *Outlines of Oryctology* (1822), both standard; and his books on home treatment: *The Villager's Friend and Physician* (1800; 2d ed., 1802); *Medical Admonitions to Families* (1803; 5th ed., 1807).

PARKINSONIA (Neo-Lat., named in honor of John Parkinson, an English botanist of the seventeenth century). A genus of plants of the family Leguminosæ. *Parkinsonia aculeata* is a West Indian, Texas, and California shrub or small spiny tree with pinnated leaves, and large yellow flowers spotted with red. When in flower it is one of the most splendid objects in the vegetable kingdom. It is often used for hedges; hence its name Barbados flower fence. The bark yields a beautiful, white, short, but rather weak fibre, which might be used for paper making. *Parkinsonia microphylla* and *Parkinsonia torreyana*, both commonly known as Palo Verde tree or green-barked acacia, are small trees from western Texas to California and south into Mexico.

PARKINSON'S DISEASE. See PARALYSIS AGITANS.

PARKMAN, FRANCIS (1823-93). A distinguished American historian, born in Boston, Sept. 16, 1823. Much of his boyhood was spent on the border of the Middlesex Fells, a rough and rocky woodland. He graduated with high rank at Harvard in 1844 and then studied law for two years in the Harvard Law School, but never practiced. Having become interested in American history, he selected, as his life work, the writing of the story of the rise, decline, and fall of the French power in America. With this thought in mind, he at once began to prepare himself for his great task. In his vacations he visited historic scenes connected with

the struggle between the French and the English and made a study of several Indian tribes yet remaining in New England, New York, and southern Canada. In 1842 he journeyed to Italy in search of health and there spent some time in a monastery of the Passionists. In 1846, feeling the need of seeing Indians who were still in an entirely primitive state, he traveled westward with a friend and in company with a tribe of Dakotas spent several months in the Black Hills, in the Platte River country, and on the eastern slopes of the Rocky Mountains. An account of this expedition appeared the next year in the *Knickerbocker Magazine*, under title of "The Oregon Trail," and was republished two years later in book form as *California and the Oregon Trail*.

The hardships he endured while in the West resulted in the breaking down of his health, and he remained a semi-invalid all the rest of his life. Despite this misfortune he continued in his work and succeeded, in 1851, in bringing out the first of his historical works, *The Conspiracy of Pontiac* (2 vols.). Fourteen years elapsed before he was able to complete a second. A part of this period he devoted to collecting material, both in America and in Europe, and to writing a novel, *Vassall Morton*, which appeared in 1856, but which met with little success. During much of the time, however, his health was so bad that he was forced to abstain almost entirely from literary work. To occupy his time he interested himself in horticulture and acquired such a knowledge of the subject that in 1866 he published *The Book of Roses* and in 1871 was made professor of horticulture in the Bussey Institution (Harvard University). This position, however, he resigned the next year. In 1865 the second of his historical works, *Pioneers of France in the New World*, appeared. This volume embodies in noble and enduring prose the leading facts in regard to the ill-fated venture of the French in Florida and the story of Champlain and New France. It was followed in 1867 by *The Jesuits in North America*, in 1869 by *La Salle and the Discovery of the Great West*, in 1874 by *The Old Régime in Canada*, in 1877 by *Count Frontenac and New France under Louis XIV*, in 1884 by *Montcalm and Wolfe* (2 vols.), and in 1892 by *A Half-Century of Conflict* (2 vols.), which completed the series. Besides these works, he published also an *Historic Handbook of the Northern Tour* (1885), and numerous articles, many of them advance chapters from his histories, in magazines and other periodicals. During all this time his health continued to be precarious, and his eyes were so weak that his material, collected for him by hired copyists, had to be read to him, and he was forced to rely almost entirely upon dictation instead of the pen. The story of his struggle against such odds is one of the most heroic in the history of literature. He died at his home at Jamaica Plain, Mass., Nov. 8, 1893, the year following the completion of his great work.

Authorities are unanimously agreed that to Parkman belongs a place with such historians as Bancroft, Prescott, and Motley, and many are of the opinion that his work will live longer than any other that has yet been done in the field of North American history. In him, in fact, existed a combination rare among historians; for while he was a scholarly and indefatigable investigator, he was at the same

time a consummate literary artist. His search for material was one of the most exhaustive that any historian has ever made. He seven times visited Europe, and while there sought out the documents bearing upon the period about which he intended to write. He visited also all the important localities mentioned in his story, and his knowledge of the Indians and of the wild life of the woods was invaluable. Parkman was the first great author who really understood the Indian's character and motives. Courage, whether of priest, soldier, or savage, appealed powerfully to the historian, whose own life was an example of such rare heroism. In a paper that was read after his death and printed in the Massachusetts Historical Society's *Proceedings* for 1893, Parkman described his sufferings and the unfavorable conditions under which he labored. Consult: C. H. Farnham, *A Life of Francis Parkman* (Boston, 1901); H. D. Sedgwick, *Francis Parkman* (ib., 1904); H. C. Vedder, *American Writers of Today* (new ed., New York, 1910).

PARKS, LEIGHTON (1852-). An American Protestant Episcopal clergyman. He was born in New York City and graduated from the General Theological Seminary in 1876. Ordained a priest the next year, from 1878 to 1904 he was rector of Emmanuel Church, Boston. He then became rector of St. Bartholomew's Church, New York, succeeding David H. Greer, who had been elected Bishop of the diocese. Dr. Parks, who became noted for his direct and uncompromising preaching to one of the wealthiest congregations in the country, published *The Winning of the Soul and Other Sermons* (1893) and *Moral Leadership and Other Sermons* (1914).

PARKVILLE. A city in Platte Co., Mo., 10 miles by rail south-southwest of Kansas City, on the Missouri River, and on the Chicago Great Western and the Chicago, Burlington, and Quincy railroads (Map: Missouri, B 2). It is the seat of Park College, founded in 1875, and contains a Carnegie library. There are stone quarries and flour mills, and willows for rippingrap are shipped from here. Pop., 1910, 765.

PARLEMENT, *Fr. pron.* pärl'män'. This meant originally a colloquy or conference. It was then used to designate a session of the Curia Regis. Finally it came to be the name for the supreme court. The Parlement of Paris, the most influential and celebrated of the French parlements, had its origin in the Curia Regis of the Frankish kings, an assembly consisting of the lay and ecclesiastical dignitaries of the court which met under the presidency of the King or his representative and exercised a wide though undefined jurisdiction. Broadly speaking, its powers extended to all cases involving the royal interest, but it also heard appeals from inferior courts where delay or denial of justice was concerned. Under the Carolingian monarchs it was the court for the trial of cases involving the high nobility, and its jurisdiction was also extended over all persons living under the royal protection. In the course of time the Curia Regis fell apart into three separate bodies: the *conseil de roi*, the *chambre des comptes*, and the Parlement proper, which first appears under St. Louis. Under Philip the Fair the *légiſtes*, or members of the learned bourgeoisie, began to enter the Parlement, which up to then had been composed exclusively of the

lay and ecclesiastical nobility. These came to constitute a very important element in the body, as is indicated by an ordinance soon after 1296, which ordered that 18 laics and 16 clerks should always be in session for the doing of judicial business. The Parlement at this time comprised three chambers: the *grand' chambre*, or full Parlement, meeting for the rendering of decrees; the *chambre des enquêtes*, to which was referred the greater mass of detailed work, such as preliminary investigation and the sifting of testimony; and the *chambre des requêtes*, which received the petitions of those desiring to come within the jurisdiction of the Parlement. From 1417 to 1436, while Paris was in the hands of the English, the Parlement was in session at Poitiers. In 1467 the irremovability of members of Parlement was practically established. The method of admission at this time was by royal appointment from a list submitted by the Parlement, but frequently the kings exercised the power of direct appointment. Under Francis I the principle of purchase became general; nominations henceforth ceased, and membership, as a rule, passed from father to son, resulting in the establishment of a so-called nobility of the robe, class conscious, jealous of its prerogatives, and careful of furthering its interests. The salary was small, and the chief income of the magistrates was derived from fees, which were very high. The kings at various times sought to increase their revenue from the sale of offices, by increasing the number of members of Parlement, or even the number of chambers, there being at one time no less than nine of these in the Parlement of Paris. In 1604 the so-called Paulette was introduced, in accordance with which members of Parlement paid an annual fee of $\frac{1}{10}$ of their income, in return for which their office on death passed to their heirs.

The provincial parlements had their rise after the Hundred Years' War. As the great fiefs were reunited with the crown, parlements were established in the local capitals to perform the same judicial functions as the Parlement of Paris did within its jurisdiction. The Parlement of Toulouse was established in the thirteenth century, but was dissolved after some time and was not definitely reestablished till 1443. The other local parlements, with the date of their foundation, were as follows: Grenoble, 1453; Bordeaux, 1462; Dijon, 1477; Aix, 1501; Rouen, 1515; Rennes, 1554; Pau, 1620; Metz, 1633; Besançon, 1676; Douai, 1686; Nancy, 1775. The parlements were all on a basis of equality in that each was supreme within its jurisdiction, but a certain predominance was enjoyed by the Parlement of Paris, whose decrees after 1474 seem to have been binding in any part of the Kingdom without the *visa*, or confirmation, of the local Parlement. For the facilitation of business the Parlement sometimes sent out a number of its members to hold court in different places. These courts were known as *Grands Jours* and constituted practically courts of assize.

The political importance of the Parlement of Paris dates from the reign of Charles VI. Under Louis XI it began definitely to put itself into opposition to the royal will in matters of legislation and administration by attempting to modify the text of the royal edicts submitted to it for registration (*enregistrement*) or by rejecting them altogether. The process of regis-

tration, which in the beginning was merely formal and largely in the nature of an act of record, had come in time to be regarded by the Parlement as essential for the validity of all royal decrees. The kings met the opposition by letters of "jussion" commanding the Parlement to register, frequently too by imprisonment and exile. Before the end of the sixteenth century the common form was by means of a royal bed of justice (q.v.), where the King appeared in solemn state and ordered the Parlement to register the obnoxious decree. The parlements exercised great influence during the period of the civil wars when they were strongholds of catholicism. They submitted, however, to Henry IV. The Parlement of Paris sought to assert its authority during the reign of Louis XIII, but failed before the masterful will of Richelieu. Under Louis XIV Parlement, after playing a leading part in the troubles of the Fronde (q.v.), was restricted entirely to its judicial functions. After that monarch's death, however, the Parlement declared his will invalid and vested the regency in the Duke of Orléans. Thereafter it was engaged in continuous struggles against the crown in the hope of regaining its former power. It was conspicuous in the Jansenist controversy in connection with the bull *Unigenitus* (see JANSENISM) and was the bitter enemy of the Jesuits, whose expulsion it brought about. The conflict between the Parlement and the crown culminated in the coup d'état of 1771, when the Chancellor Maupeou declared all the offices of the Parlement vacant and organized a new body whose authority was greatly curtailed by the establishment of six superior courts in the territory formerly under the jurisdiction of the Parlement. Purchase and fees were abolished. In spite of the fact that the change was on the whole for good, the new Parlement—the Parlement Maupeou, as it was called—was extremely unpopular, and when Louis XVI succeeded to the throne he restored the old magistrates. The quarrels with the crown nevertheless continued, the Parlement making itself the mouthpiece of the new ideas of popular rights, national sovereignty, and thoroughgoing reform. Its protestations, however, were not entirely sincere, as was evidenced at the summoning of the States-General in 1787, when it showed itself no less jealous of its prerogatives than the nobility or the clergy. It lost thereby the popularity which it had enjoyed for some time, and in 1790 the Parlement of Paris, with the provincial parlements, was abolished by the National Assembly. As judicial tribunals the French parlements take a very high position among such institutions in history. Though narrow in spirit as far as concerned their privileges as a caste, they nevertheless were usually just in the decision of cases and were largely instrumental in unifying the customary law of France.

Bibliography. Sources: A. A. Beugnot, *Les Olim* (3 vols., Paris, 1839-48); Edgard Boutrac, *Actes du Parlement de Paris* (2 vols., ib., 1863-67); C. V. Langlois, *Textes relatifs à l'histoire du Parlement, 1214* (ib., 1888); J. G. Flammermont, *Remonstrances du Parlement de Paris au XVIII^e siècle* (3 vols., ib., 1888-98); Guillaume Du Breuil, *Stilus curie parlamenti*, edited by Felix Aubert (new ed., ib., 1909). These works have valuable introductions, and Langlois has an excellent bibliography. Among second-

ary accounts the following are important: Le Vicomte de Bastard d'Estang, *Les parlements de France* (2 vols., Paris, 1857), mainly for Toulouse; P. A. Cheruel, *Dictionnaire historique des institutions, etc.* (4th ed., 2 vols., ib., 1874); J. G. Flammermont, *Le Chancelier Maupeou et les parlements* (ib., 1884); C. V. Langlois, "Les origines du parlement," in *Revue Historique*, vol. xlii (ib., 1890); Achille Luchaire, *Histoire des institutions monarchiques de la France* (2d ed., 2 vols., ib., 1891); Paul Guilhiermoz, *Enquêtes et procès* (ib., 1892); Félix Aubert, *Histoire du Parlement de Paris, 1515* (2 vols., ib., 1894); Adhémar Esmein, *Cours élémentaire d'histoire du droit français* (4th ed., ib., 1901); E. D. Glasson, *Le Parlement de Paris* (2 vols., ib., 1901); Paul Viollet, *Histoire des institutions politiques, etc.*, vol. iii (ib., 1903).

PARLEMENTAIRE, pär'lë-män'târ'. See PARLEY.

PARLER, pär'lër, PETER (c.1333-c.97). The most famous and successful of a family of German architects. He was born probably in Cologne, and his name seems to have been corrupted in Bohemia from Arler to Parler, possibly under the influence of *Parlierer* or *Polier*, a German word used among masons and bricklayers, signifying "foreman." Like his father, Heinrich, he got his early training in Cologne. In 1356 he was architect on the Prague Cathedral, of which he built the choir. His brother, JOHANNES, became master architect of the cathedral of Freiburg in 1359. Some members of the family were known by the name of Von Gmünd. All are classified by Klemm in the *Allgemeine deutsche Biographie*. Consult Neuwirth, *Peter Parler von Gmünd und seine Familie* (Prague, 1891).

PARLEY (OF. *parlee*, turn of speech, from *parler*, to speak, from ML. *parabolare*, to discourse, from Lat. *parabola*, comparison, speech, parable). In military affairs this term is used to describe the conversation between antagonists, which may be introductory to an exchange of prisoners, burial of dead, care of wounded soldiers, or any other nonhostile intercourse of belligerent armies. Hostilities are temporarily suspended in the vicinity near where the parley takes place. A parley is usually preceded by a flag of truce, although it may be preceded by a roll of drums, known as *beating a parley*. In the *Rules of Land Warfare, United States Army, 1914*, the word "parlementaire" is officially adopted to designate the agent in the nonhostile intercourse of belligerent armies. His duties include every form of communication with the enemy in the field. The adoption of the word "parlementaire" was considered absolutely essential in order to avoid confusion and because all other nations, including Great Britain, utilized the word. In the past this word was translated at times to mean the agent or envoy only; at other times, the agent and emblem, or both. To call the parlementaire "the bearer of the flag of truce" is not in reality correct, because he seldom, if ever, actually carries it. In the annex to The Hague Convention, No. IV, of Oct. 18, 1907, are found the following rules relating to the methods of conducting the intercourse or parley, and the rights and restrictions of the agent or parlementaire: H. R. xxxii., "A person is regarded as a parlementaire (bearing a flag of truce) who has been authorized by one of the belligerents to

enter into communication with the other, and who advances bearing a white flag. He has a right to inviolability, as well as the trumpeter, bugler, or drummer, the flag bearer, and interpreter who may accompany him." H. R. xxxiii. "The commander to whom a parlementaire is sent is not obliged to receive him under all circumstances. He may take all the necessary steps to prevent the parlementaire from taking advantage of his mission to obtain information. In case of abuse he has the right to detain the envoy temporarily." H. R. xxxiv. "The parlementaire loses his right to inviolability if it is proved in a clear and incontestable manner that he has taken advantage of his privileged position to provoke or commit an act of treachery." Consult *Rules of Land Warfare, United States Army, 1914*, published by the War Department (Washington, 1914).

PARLEY, PETER. See GOODRICH, SAMUEL GRISWOLD.

PARLIAMENT, pärli-ment (OF., Fr. *parlement*, discourse, conference, legislature, from *parler*, to speak) The name of the legislative assembly of Great Britain and Ireland. The legislative assemblies of Scotland and of Ireland previous to the union with England (1707) and Great Britain (1800) respectively bore the name of Parliament. This is also the designation of the Legislatures of the Dominion of Canada and of the Commonwealth of Australia. The parliaments (*parlements*) which existed in France before the revolution of 1789 were not legislative but judicial bodies. The word was first used by Matthew Paris in 1246, but only gradually replaced the terms by which the councils of the English King had previously been known. Moreover, even when so called, Parliament had not at first the privileges and functions which it exercises to-day. Modern Parliament has developed slowly from the Witenagemot of Anglo-Saxon times. This body was composed of princes, prelates, ealdormen, and a varying number of royal nominees. It met thrice yearly, had the power of electing and deposing kings, gave counsel and assent in matters of legislation, and was the supreme court of justice for the Kingdom. It was in no sense a representative and legislative body, but a council of *witan*, or wise men, assembled to advise the King. After the Norman Conquest the Witenagemot gradually lost its old significance, together with its name, and was merged in the Great Council, an assembly to which in theory every tenant in chief of the King belonged. This was generally attended only by royal officials, the great prelates, earls, and those barons who were individually summoned. The powers of the body were three: it held a somewhat loose control over taxes, it gave consent to laws proposed by the King, and it acted as a court of justice. The first function became of some importance by the end of the twelfth century, when the idea that taxation and representation go hand in hand first germinated; the second was exercised to good purpose in great crises like the conflict between Henry II and Thomas à Becket; but the third developed earliest and gave the Council its peculiar character.

With the granting of the Great Charter on June 15, 1215, by King John, the national assembly entered upon an important period of transition (See MAGNA CHARTA). The commons, especially the citizens of London, had

given important aid to the barons in their struggle, and the latter obtained certain privileges, personal and commercial, for them. More important was the fact that for the first time the nobles and commons were thus united against the crown. The Great Charter provided that no scutage or aid, other than for delivering the King from captivity, for knighting his eldest son, or marrying his eldest daughter, should be levied without the consent of the Great Council, which was to be summoned at least 40 days before the appointed date for meeting, so that all might have time to attend. The document took no notice of the representative principle, however, and the minor barons subsequently regarded themselves as exempt from attendance at the Great Council because they were no longer entitled to summons by special writ. But, curiously enough, John had already recognized the principle of representation in 1213, when he summoned to the Council of St. Albans the reeve and four men from each vill on the royal demesne. This is the first occasion where all three estates—nobles, clergy, and commons—met at the same time. Recognition had thus been gained for the ideas of representation, election, and concentration in a central assembly, but until 1254 the experiment seemed abortive. In that year Queen Eleanor and Earl Richard of Cornwall, regents during the absence of Henry III in Gascony, called a council to meet at Westminster, at which were present two knights, chosen at the shire moot of each shire, to report the amount their constituents were willing to grant the King for waging war. This element was to be of great importance in the development of Parliament, since the knights of the shire henceforth furnished leaders for the commons, and, many of them being nearly related to the nobles, they enabled the two estates to unite in opposition to the crown.

In spite of the part played by the commonalty in these early attempts at constitutional reform, the tendency of the time was oligarchical. This is clearly shown by the struggle between Henry III and Simon de Montfort (qqv). Though in the course of it distinction was first made between the representatives of shires and of boroughs, Simon called upon the commons only to further his ambitious plans and even then gave them no voice in the formation of his governmental scheme. In 1258 a form of provisional government was ratified, embodied in the Provisions of Oxford (qv), which vested the balance of power in a committee, a majority of which were barons. Henry endeavored to evade the Provisions, but Simon defeated him in battle at Lewes in May, 1264, and in January, 1265, there met at Westminster a Parliament to which Simon had summoned not only two knights from each shire, but also two burgesses or citizens from 21 boroughs or cities mentioned by name in the writ. Thus for the first time the third estate, made up of county freeholders and burgesses, was fully represented in a national assembly. Nevertheless, the importance of Montfort's act has been somewhat exaggerated. In the first place the Parliament was not truly representative. Of the lords, who as a whole were unfavorable to his cause, only five earls and 18 barons were summoned, while of the clergy, who were his supporters, there was a very disproportionate number. Furthermore, it is doubtful whether the parliamentary

representation of the third estate was intended to be permanent. Yet Simon cleverly adapted existing materials to his own ends and showed the lines on which a real Parliament was to be formed. Meanwhile there was developing on the part of the commons a tendency towards organized opposition to excessive taxation and a somewhat indefinite theory that a grant of supply should receive the consent of Parliament. It was a step in advance that Henry III recognized the necessity of support from the barons and that both parties no longer ignored the rights of the towns.

To Edward I belongs the honor of completing the work of founding Parliament. During the first 20 years of his reign, though there was no important advance, he summoned representative assemblies occasionally. Whether consciously or not, he seems to have been experimenting in order to determine the proper representation of the various classes which had crystallized during the struggle of the last reign. In 1294 the right of the clergy to give consent to taxation was formally acknowledged. In the following year Edward was beset with difficulties on account of his wars with Wales and France. He needed money and accordingly summoned representatives of the three estates, the consent of which he now recognized as essential in the matter of taxation. This assembly, which met in November, 1295, is known as the Model Parliament. To it came, aside from the bishops and the abbots, the earls and the barons, two knights from each of 37 shires and representatives of 110 cities, boroughs, and towns. The Parliament was held at Westminster, which became from this time the regular meeting place of the assembly. That Parliament was not formed into three chambers rather than into two was due to the attitude of the lower clergy, who soon withdrew and voted grants of money in their own assembly or convocation. It was not till the reign of Edward III that the definite separation into two Houses took place. The knights at first vacillated between the lords and the commons, but in 1332 is found the first clear reference to the arrangement which after 1339 was permanent, the lords forming the Upper House, the knights and burgesses the Lower.

If the thirteenth century marks the formation, the fourteenth century is especially notable for the development of the privileges of Parliament. In 1322 Edward II definitely acknowledged that "the matters to be established for the estate of our lord the King and of his heirs, and for the estate of the realm and of the people, shall be treated, accorded, and established in parliaments by our lord the King, and by the assent of the prelates, earls, and barons, and the commonalty of the realm, according as hath been hitherto accustomed." Though the position of the Lords and Commons was thereby recognized, the latter had yet to struggle for actual power. Laws were still made by means of petitions to the King, and only the King could proclaim them. A purely formal survival of this condition explains the phraseology of the laws in our own time, which, according to the stereotyped preamble, always emanate from the crown, Parliament merely consenting. The Hundred Years' War (q.v.) still further increased the power of Parliament, because with the necessity of appealing to the people to meet the enormous expenses which

that war entailed upon the government, it became customary to demand from the King a redress of grievances before granting him a subsidy. The advance in privilege during the period from the accession of Edward II to the death of Henry V may be further summarized as follows: 1. By the Ordinance of 1311, succeeded by the Acts of 1330 and 1362, it became the rule to summon parliaments every year. This provision was often evaded, but regular and frequent assemblies were nevertheless held throughout the fourteenth and fifteenth centuries. 2. From 1340 taxation without the consent of both Houses was illegal. 3. After 1407 the Commons possessed the preponderating voice in making money grants. 4. Parliament began to exercise the right of supervising expenditure, which involved not only the audit of accounts, but also the impeachment of royal officials. This was first done by the Good Parliament (q.v.) in 1376 and constituted an early but important step towards ministerial responsibility.

The Wars of the Roses proved in a manner detrimental to the development of Parliament, since the destruction of the powerful nobles left the Commons unaided in their struggles against the crown. Yet the practice of introducing legislation by means of bills instead of petitions, which was begun in the reign of Henry V, became firmly established in the reign of Henry VI and really laid the foundations for the subsequent power of Parliament. During the earlier part of the Tudor period Parliament was denied even the semblance of power, but Thomas Cromwell showed Henry VIII the way to use it for his own ends while observing the letter of the law. Subsequently the Tudors were despots by means of their control over Parliament. The course they followed was this: (1) occasionally they employed the old device of dispensing with Parliament altogether; but (2) they found a safer method in creating a number of small boroughs, later called "rotten boroughs," and narrowing the right of franchise; (3) they secured the nomination of the Speaker of the Commons and made the Secretary of State a member of that body; (4) as a last resort they fell back upon the royal prerogative of government by proclamation. The Reformation also worked towards the same end, since the loss of the 27 abbots and priors to the Upper House left the temporal peers in the majority and gave the crown the opportunity of controlling the Lords by means of new creations by letters patent. At first temporal peers had been the great tenants in chief; from the time of John they were those barons who received personal summons to the Great Council; under Edward I such barons were confirmed in their hereditary rights; but not till the device of creation by letters patent was established did the hereditary peerage in the modern sense appear. Instances of such creations are found as early as the reign of Stephen, but they were rare till the time of Richard II. Since the Reformation the spiritual Lords have been the two archbishops and the several bishops holding English dioceses. In connection with the House of Lords it is necessary to note the peculiar function of acting as a court of last resort, a right which it has kept since the separation of the Privy Council from Parliament in the reign of Richard II.

With the accession of James I (q.v.) in 1603

began the last great struggle between Parliament and the crown. The Tudors had been able to retain their personal popularity and to rule somewhat despotically because they held to a definite public policy. The Stuarts, in default of this, obstinately asserted the principle of divine right, which was peculiarly obnoxious to the Puritan party, at that time just becoming strong. Moreover, James was a foreigner and understood the needs of Scotland better than those of England. The struggle with Parliament continued throughout his reign and that of his son, Charles I (q.v.), resulting in the Great Civil War and the rule of Oliver Cromwell (q.v.) The strife centred about the right of taxation and the right to impeach royal officials or about responsibility of ministers to Parliament. In both of these matters the House of Commons ultimately won a complete victory, as also in the subsidiary question of the inviolability of its own members. Though the army was all-powerful during the Protectorate itself, the Restoration found Parliament in possession of the rights for which it had long struggled. The reign of Charles II was strictly parliamentary, at least as far as outward forms went, and freedom of speech in Parliament was definitely established. In this reign, moreover, the influence of the Lower House was vastly increased by the provision that bills for the grant of supplies must not be amended by the Lords. With Charles II also appeared the cabinet, or body of ministers who lead Parliament and are responsible to it, though as yet this represented no definite party or system. The number of members of the House of Commons for England and Wales, which had been greatly increased by the crown in preceding reigns, now became fixed at 513. This rigidity increased the abuse of rotten boroughs, while new centres of population remained unrepresented. The loss of its power of creating boroughs was a serious blow to the crown, but it still enjoyed great influence by means of appointment to lucrative offices and even grosser forms of bribery.

Though the revolution of 1688 was hardly due to parliamentary struggles, its effect upon the development of the powers of Parliament was far-reaching. The Bill of Rights (1689) marked the end of the long struggle between the crown and the Legislature and established the principle that the right of the throne depends on parliamentary recognition. This was more clearly shown in 1701 by the Act of Settlement, which vested the crown in the Protestant succession. By the Triennial Act of 1694 the life of Parliament—originally limited to a single session but under the Tudors and Stuarts extended in some instances to several years—was limited to three years. This did away with the possibility of the King keeping a subservient Parliament in existence after it had lost the confidence of the nation. The limit was extended to seven years by the Septennial Act of 1716, which is still in force. Not since 1707 has the crown vetoed a measure passed by the two Houses. The eighteenth century is notable for the development of the party system, though the Whigs and Tories had existed under these names since 1679. In connection with the rise of parties appeared the completely developed cabinet government, whereby the crown is compelled to select its ministers from the dominant party in the House

of Commons. The fact that George I was a foreigner and unable to speak English had much to do with this change in government. George III (q.v.), indeed, tried to create a party of his own, but failed. Henceforth the maxim that "the King reigns but does not govern" represents the spirit of the English constitution. In 1707, by the union of Scotland with England and Wales to form the Kingdom of Great Britain, certain changes were made in the composition of Parliament. Scotland received 45 members in the House of Commons, while its peers were to elect for every Parliament 16 representatives from their number to sit in the Upper House. As the crown was restrained from creating new peers for Scotland, the Scottish peerage is gradually becoming extinct. In 1800 the Irish Parliament also ceased to have a separate existence, and Ireland was to be represented in the Parliament of Great Britain and Ireland by one of the four archbishops and three of the 18 bishops sitting by rotation of sessions, by 28 temporal Lords elected for life by the Irish peerage, and by 100 members of the House of Commons. The spiritual Lords lost their seats in 1870, however, in consequence of the disestablishment of the Irish church. The nonrepresentative Irish peers may be elected to the House of Commons, and many, like Lord Palmerston, have had distinguished careers in that body.

In the latter part of the eighteenth century parliamentary corruption became notoriously prevalent. In 1793 the Duke of Norfolk had 11 seats for rotten boroughs in his gift, and many other wealthy men were answerable for a lesser number. Moreover, many great towns had no representatives whatever in the House of Commons. After various abortive attempts at the reform of parliamentary representation by the younger William Pitt and others, the question became acute at the close of the Napoleonic wars and did not cease to agitate the Kingdom during the greater part of the nineteenth century. Legislative measures began with the great Reform Bill of 1832, which was passed after the opposition of the peers had been overcome by the threat of numerous creations. This act remodeled Parliament. In England 143 votes were taken from boroughs and redistributed among the counties and large towns. The county franchise was given to freeholders or copyholders to the value of £10 a year, to leaseholders for 20 years whose annual rent was £50, and to tenants at will who paid £50 a year. The borough franchise was given to all holders of houses to the annual value of £10. For Scotland the number of members was increased from 45 to 53, of whom 30 were to sit for the counties and 23 for the cities and boroughs. The county franchise was given to all holders of property to the annual value of £10, while the borough franchise was made the same as that of England. For Ireland the number of members was raised from 100 to 105. Both the borough franchise and the county franchise were given as in England, except that the occupation franchise in the counties was limited to holders of land to the value of £20 per annum. This provision was designed to prevent the control of the priests, who were much feared after the Catholic Emancipation Act of 1829. With the Reform Bill the parties took new names, the Tories being succeeded by the Conservatives, the Whigs by the Liberals.

ince then Parliament has undergone little change in its essential features, though several form acts have been passed. In 1867 household suffrage was established in boroughs, with lodger franchise at a value of £10; in the unties existing qualifications were reduced one-half, and an occupation franchise at £12 as created. There was also a slight redistribution of seats. In 1872 voting by secret ballot as established. In 1884 there was a thorough distribution of seats, with an attempt to make equal electoral districts, and an assimilation of county and borough franchises. In 1885 the franchise was again somewhat extended so as to include the agricultural laborer, and at present there is nearly universal suffrage in Great Britain and Ireland. Meanwhile the House of Commons has become by far the most important branch of the government. It rules the country absolutely and is quickly responsive to popular demands.

The constitutional crisis which culminated in the Parliament Bill of 1911 may be said to have had a history reaching far back into the nineteenth century, but the latest aspects of the conflict between the two Houses developed after a change of ministries in 1905. Gladstone, indeed, on the occasion of the rejection of the Home Rule Bill of 1893 by the House of Lords, had predicted that the question of relative power thus precipitated would be carried forward eventually to a definite and final issue. After the assumption of control by the Liberal Government in 1905, the House of Lords, which is overwhelmingly Conservative, began to oppose the measures of the Commons, and thus a progressive legislative programme of the Liberals was defeated. In 1906 the education, census, and plural voting bills were thrown out. Premier Campbell-Bannerman, in 1907, said: "It is necessary that the power of the other House to alter or reject bills passed by this House should be so restricted by law as to cure within the limits of a single Parliament at the final decision of the Commons shall prevail." The situation remained unchanged, however, until the revolutionary budget of Lloyd-George was rejected by the Lords in 1909. His action seemed to challenge the supremacy of the Commons in matters of finance, and the question was submitted to the country. The election of 1910 resulted in victory for the Liberal coalition, and the government then insisted that not only should the budget be accepted, but that the constitution should be altered so as to remove the veto power of the Lords. At length, when introducing and defending a bill to this end, stated that the government ought that the continuance of the bicameral system was necessary, but that the predominance of the Commons must be insured. The second chamber should exist for the functions of consultation and revision and in order to prevent undue haste in important legislation. Lord Rosebery immediately endeavored to force all the government by proposing a reform within the House of Lords, introducing representative and democratic elements, but the Liberals decided first to deprive the Lords of their power and then to allow reformation. The death of King Edward, in 1910, caused a delay in the settlement and a moderation of extreme views. A conference of the leaders on both sides was arranged, but after 21 meetings it failed to agree upon a bill, and the government

decided to appeal to the people. The second election also resulted in success for the government, and the Parliament Bill (1 and 2 Geo. V, c. 13) was introduced. This bill had in prospective consideration the substitution of a second chamber "constituted on a popular instead of a hereditary basis" for the existing House of Lords; but in the meanwhile it sought to destroy the absolute veto. It provided that all money bills (such as were so certified by the Speaker), if not passed by the House of Lords, may become law without the concurrence of that House if the Commons insist and the bill receives the royal assent. Public bills, other than money bills or a bill to extend the maximum duration of the Parliament beyond five years, may become law without the consent of the Lords if passed by the Commons in three successive sessions, whether in the same Parliament or not, provided that not less than two years shall have elapsed after the second reading after introduction and the third reading of the final passage. This act changed the length of Parliament from seven to five years. It was adopted after an extremely bitter and dramatic fight between parties, in which public opinion was deeply agitated, the Lords yielding only under the threat that new peers would be created in numbers sufficient to overcome opposition. The government also forced a measure providing for the payment of a salary of £400 to members of the House of Commons.

The following table illustrates the composition of the House of Commons in 1914:

	Counties	Boroughs	Universities	Total members
England.....	234	226	5	465
Wales.....	19	11	0	30
Scotland.....	39	31	2	72
Ireland.....	85	16	2	103
	377	284	9	670

Details concerning the existing system of parliamentary government will be found in the section *Government under UNITED KINGDOM*, but something remains to be said of certain customs of Parliament. The Houses of Parliament or New Palace of Westminster, in which Parliament sits, were opened in 1852, though the assembly has had its abode on that site for six centuries. The former building was destroyed by fire in 1834. The Commons' Chamber is in the north side of the building, the Lords' in the south. About them are the retiring rooms of their respective members, and the residences and bureaus of their officials, aside from a great number of other apartments. Unless sooner dissolved, a Parliament lasts for five years. It meets about the middle of January or early in February, and when it has completed its work it is prorogued, though either House may adjourn for a short time on its own initiative. Business is now rarely completed before August or September. A new Parliament is opened with imposing ceremonies, the hour fixed being usually two o'clock. In the morning the vaults are searched for possible bombs and the like, in memory of the plot of Guy Fawkes (q.v.). The House is opened by the clerk, who is chairman till the Speaker is elected. The first incident of the session is the summoning of the Commons to the Peers' Chamber by the Black Rod, the mes-

senger of the Upper House, to hear the royal message. When the King does not open Parliament in person, this is read by the Lord Chancellor. Before the actual reading of the King's speech the Commons return to their own chamber to elect a Speaker. The Speaker is not a party leader, as in the United States, but is supposed to be strictly impartial and is usually reelected regardless of the party in power. He receives an annual salary of £5000 and has some perquisites, such as an official residence. He ranks as first commoner, and when he retires he is usually rewarded with a peerage and a yearly pension of £4000. The chairman of the House of Lords is the Lord Chancellor, whose official seat is the celebrated woolsack. He is ordinarily a member of the cabinet. Most of the measures introduced into Parliament are government bills, and a vote is taken by the members passing out of different doors into the lobby and being counted in the process. Each party has designated members, known as "whips," who gather the party forces for important divisions in the House of Commons.

Contempt of Parliament. Persons guilty of insults to the dignity, disobedience to the commands, or of infringement of the rules and privileges, of either House of Parliament are held in contempt and are subject to punishment inflicted at the discretion of the House offended. Lord Ellenborough, in the famous case of *Howard v. Gosset* (10 Q. B., 151), stated that either House has "the power to cause the person charged to be taken into custody and to be brought to the bar to answer to the charge." The Chancellor for the Lords and the Speaker for the Commons issues a warrant for the arrest of the offender, who is then brought before the bar to be examined. The power of Parliament to punish contempt was recognized from the first, but controversies arose in the contests between executive and legislative departments. It is unquestionable, ultimately, however, that Parliament and particularly the House of Commons can override any court and inflict punishment for contempt at discretion. Consult E. May, *Constitutional History of England* (London, 1863), and W. R. Anson, *Law and Custom of the Constitution* (Oxford, 1909).

Bibliography. G. B. Smith, *History of the English Parliament* (London, 1892); Rudolph von Gneist, *The English Parliament in its Transformations of a Thousand Years* (Eng. trans., 4th ed., ib., 1895); B. C. Skottowe, *A Short History of Parliament* (4th ed., ib., 1895); G. L. Dickinson, *The Development of Parliament during the Nineteenth Century* (ib., 1895); L. C. Jane, *Coming of Parliament, England from 1350 to 1660* (New York, 1905); C. H. Hayes, *British Social Politics* (ib., 1913). For the interesting customs of Parliament and its methods of work, consult Michael MacDonagh, *The Book of Parliament* (London, 1897); Courtenay Ilbert, *Parliament: Its History, Constitution, and Practice* (New York, 1911); Michael MacDonagh, *The Speaker of the House of Commons* (London, 1914); also references under ENGLAND: UNITED KINGDOM.

PARLIAMENT, HOUSES OF, or NEW PALACE OF WESTMINSTER. The seat of the British legislature, a great mass of buildings on the Thames in London, built (1840-57) at a cost of \$15,000,000 after plans by Sir Charles Barry, on the site of a previous building destroyed by fire in 1834. The edifice covers an area of 8 acres,

and contains 1100 apartments, 100 staircases, and 11 courts. The exterior, in rich late Gothic style, is made impressive by three massive towers: Victoria Tower, 340 feet high; Middle Tower, 300 feet high; and St. Stephen's or the Clock Tower, 318 feet high. The latter contains a clock with dials 23 feet in diameter and a great bell, Big Ben, weighing 13 tons. The interior of the palace is fitted up with much magnificence. In it are the sumptuous House of Peers and the simpler House of Commons, an octagonal central hall, St. Stephen's Hall on the site of St. Stephen's Chapel (the former meeting place of the Commons), the residence of the Speaker and other officials, the libraries, committee rooms, and lobbies connected with the two Houses, and offices. With the edifice is connected Westminster Hall (q.v.). An unsuccessful attempt to destroy the palace by explosions of dynamite was made in 1885. For illustration, see Plate accompanying the article LONDON.

PARLIAMENT, KNIGHTS OF. See KNIGHTS OF THE SHIRE.

PARLIAMENT, THE ADDLED. The British Parliament which was in session from April to June, 1614, in the reign of James I. It was so named because it was unable to transact any business owing to its dissolution by the King for its refusal to compromise with him on the question of impositions on merchandise.

PARLIAMENT, THE RUMP. See RUMP PARLIAMENT.

PARLIAMENTARY LAW. The body of rules and precedents regulating the procedure of deliberative assemblies. Certain rules of parliamentary procedure have always been found necessary for the accomplishment of the purposes for which deliberative assemblies are called. Experience has shown that restrictions must be placed on individual members in the general interest of the whole body, that mere customary rules are insufficient, and hence regular parliamentary codes must be prepared for the government of deliberative assemblies. In the United States this has become almost a distinct branch of the law, and its mastery is highly essential to the success of the legislator. The necessary officers of a deliberative assembly are a chairman, usually called Speaker, president, or moderator, and a secretary or clerk. It is the duty of the presiding officer to call the meeting to order; to state clearly all questions brought before the assembly; to put motions properly made and in their proper order; to preserve order and enforce the rules of procedure; and to decide questions of order subject to the right of appeal to the whole assembly. These are his primary duties, but he may in addition participate in debate as any other member and vote in case of a tie. It is the duty of the secretary to keep a record of the proceedings of the meeting, including a correct statement of every motion made and the manner in which it was disposed of; the names of members of all committees appointed; a true copy of every resolution passed, with the affirmative and negative votes cast therefor, etc.

Business is or should be brought before an assembly by motion of a member or in the form of a resolution which is presented by a member who at once moves its adoption. If it is a mass meeting called for a particular purpose, a motion is made for the appointment of a chairman, who, upon taking the chair, asks for a state-

ment of the purpose for which the meeting is called. A proposition which is presented to an assembly is usually called a motion if it relates to a matter of secondary importance and a resolution if of greater importance. The difference is of no practical consequence, however, since a resolution may be offered as a motion and a motion may be presented in the form of a resolution. The member upon whose motion the subject under discussion was brought before the assembly, or upon whose report the conclusion of a committee is presented, is entitled to be recognized as having the floor, although another member may have already risen and addressed the chair. No member who has once had the floor is again entitled to it while the same question is before the assembly so long as any member who has not spoken claims the privilege of the floor. From the decision of the chairman as to the claim of two members for the floor an appeal may be taken, or, in first instance, the chairman may refer the question directly to the assembly for decision. It is the custom, except in the United States Congress, to require important motions to be seconded as a means of assurance that the measure has the support of more than one member. The motion is often seconded as a matter of course, even though the person seconding it may not favor it. After the motion has been made and seconded the chairman clearly states it to the assembly and then recognizes the author of the motion as entitled to the floor if he wishes to claim it, otherwise the first member who rises and addresses the chair. The question is now before the assembly and cannot be withdrawn or modified by the mover, if any member objects, except by obtaining leave from the assembly or by moving an amendment. Before the chair has put the question, however, the mover may withdraw it without the consent of the assembly.

The question on the adoption of a motion or resolution is usually known as the main question, and during the consideration of it the introduction of any other question is not permissible, but it is allowable to make subsidiary motions that may aid in disposing of the main question, or such as arise incidentally in the course of the consideration of the main question, or such as relate to the rules of procedure, the privileges of members, or the termination of the meeting. Among the subsidiary motions for disposing of the main question, all of which must be decided before the main question can be acted upon, are: first in precedence, the motion to lay on the table. The purpose of this motion is to postpone further consideration of the question until some future time, when it may again be taken up, which would not be allowable had the question been disposed of by a motion to postpone either definitely or indefinitely. This is a common method of suppressing a question, and is successful whenever a majority cannot be found to take it from the table during the session. A motion to lay on the table is not open to debate, cannot be amended, nor can another subsidiary motion be applied to it. The effect of the motion is usually to place on the table everything pertaining to the subject; thus, if an amendment be ordered to lie on the table the subject which it is proposed to amend is also laid on the table. A second means of disposing of the main question by means of a subsidiary motion is the demand for the previous question. This takes

precedence of every debatable question, but is itself open to neither debate nor amendment. It applies to questions of privilege as well as to any other debatable question. Its effect is to stop immediately all debate and bring the assembly to a vote on the question pending. When a demand is made for the previous question and seconded, the presiding officer immediately puts the question, "Shall the main question now be put?" If the question is lost the discussion continues as if the motion had not been made. The previous question requires a two-thirds vote for its adoption, may be demanded on a pending amendment, and if carried, debate on the amendment only is closed, the main question being still open to debate and amendment. It may also be used on an amendment to an amendment. (See PREVIOUS QUESTION.) A third method of disposing of the main question is by means of the motion to postpone to a certain day. Debate on this motion is limited and must not go into the merits of the subject matter any further than may be necessary to enable the assembly to judge of the propriety of the postponement. The effect of this motion is to postpone further consideration of the subject until a certain time, during which period it cannot be taken up except by a two-thirds vote. When that time arrives the question is entitled to be taken up in preference to everything except privileged questions. In the fourth place, the main question may be disposed of by a motion to commit or recommit. The purpose of this motion is to refer the subject to a committee. If different committees are proposed they should be voted on in the following order: (1) committee of the whole; (2) a standing committee; (3) a special committee. The committee, if a select one, may be appointed by the chair or nominated by a member or members and elected by the assembly. The motion to commit is debatable and the merits of the question may be gone into. In the next place, the main question may be disposed of by a motion to amend, which may take either of the following forms: (1) to add or insert certain words or sentences; (2) to strike out; (3) to strike out certain words and insert others; (4) to substitute; and (5) to divide the question. A paragraph once inserted cannot be struck out or amended except by adding to it. Similarly, words inserted cannot be struck out except by a motion to strike out the paragraph or a portion thereof. Certain motions are never open to amendment; among these are the motions to adjourn, to lay on the table, to postpone indefinitely, to reconsider, an amendment of an amendment, a demand for the previous question, for the orders of the day, and all incidental questions. An amendment may itself be amended, but not so as to alter its form. While an amendment is pending it is not in order to make another motion to amend until the first amendment is disposed of. Lastly, the main question may be disposed of by a motion to postpone indefinitely. This motion opens to debate the whole question which it is proposed to amend, but, as already observed, it cannot itself be amended. Its effect is to withdraw the question from the further consideration of the assembly for the remainder of the session. The previous question applies to this motion without affecting the main question.

What are called incidental questions are those which often arise in the course of the considera-

tion of the main question and consequently take precedence of the questions out of which they arise. Such questions are unamendable and, with a single exception, are undebatable. The incidental questions are those of appeal, objection to the consideration of a question, the reading of papers, leave to withdraw a motion, and suspension of the rules. The appeal arises out of objection raised to a decision of the chair on a question of order. The decision of the presiding officer is made without debate, and if a member objects to the result of the decision he may say, "I appeal from the decision of the chair." If the appeal is seconded the chairman puts the question as follows: "Shall the decision of the chair stand as the judgment of the assembly?" If there is a tie vote the decision of the chair is sustained. The appeal is the only incidental question which is open to debate, and there are a few cases when it cannot be debated. When debatable no member is allowed to speak more than once. If the presiding officer neglects to enforce the rules of procedure, any member may call his attention to the breach of order by rising and saying, "Mr. Chairman, I rise to a point of order," whereupon the chairman will request the member to state his objection, which he does and then resumes his seat. If the chairman decides that the point of order is not well taken, and no appeal is made against the decision, the first member is permitted to resume his speech. If the decision sustains the point of order, and objection is made, he cannot continue without a vote of the assembly. It is in order for any member to object to the consideration of the main question before debate has begun on it. The objection does not require a second, and may be made while another member has the floor. It cannot be debated, amended, or have any other subsidiary motion applied to it. Whenever objection is raised to the consideration of a motion the chairman states the question, "Shall the question be considered?" Unless an affirmative vote of a two-thirds majority is secured, further consideration for the remainder of the session is ended, otherwise the discussion continues as though objection had never been raised. The purpose of this motion is not to cut off debate, but to avoid the discussion of any question which may seem irrelevant or inexpedient. Any member has the right to ask for the reading of papers for the information of the assembly, but if an objection is raised the decision is rendered by the chair subject to appeal to the assembly. It is in order for the mover of a question which is before the assembly to withdraw it or substitute another in its place, if no one objects. If objection is made it is necessary to obtain leave to withdraw or substitute, which may be done by motion. Such a motion is neither debatable nor amendable. A motion to suspend the rules is one of the important incidental motions. Like the others of its kind, it cannot be debated or amended. It cannot be renewed at the same meeting for the same purpose, nor is it allowable except for a definite purpose, and then only by a two-thirds vote.

Another class of motions are those which are commonly known as privileged questions. They take precedence of all other questions, and are not open to debate except when they relate to the rights of the assembly or of its members. Privileged questions include motions to fix a time for adjournment, to adjourn, motions relative to rights and privileges of the assembly or

of its members, and the call for the orders of the day. The motion to fix a day for adjournment takes precedence of all other privileged motions, and is in order even after the assembly has voted to adjourn, provided the chairman has not announced the result of the vote. Next in precedence is the motion to adjourn. This motion is neither debatable, amendable, nor open to reconsideration after a vote has been taken. If the adjournment does not close the session, all unfinished business has precedence over new business at the next meeting and is treated as if there had been no adjournment. If the adjournment closes the session, and the next session is that of a new assembly, an end is put to all business unfinished at the close of the session, and it can be brought before the assembly only by being reintroduced. Questions of privilege are decided by the presiding officer, subject to the right of any two members to appeal from the decision. The assignment of one or more subjects to a particular day constitutes the orders of the day, and they are not open to consideration before that time except by a two-thirds vote. The orders of the day are classified as special and general, the former always taking precedence of the latter. A special order involves suspension of all rules that interfere with its consideration at the time specified, and it therefore requires a two-thirds vote to make any question a special order. The effect of an affirmative vote is to withdraw the question then under consideration as though an adjournment had happened. It is in order at any time, even though the floor is already occupied, to move a reconsideration of a previous vote on any measure, unless another question is before the assembly at the time. Unless the vote is by ballot the motion to reconsider must be made by a member of the prevailing side, and only on the day the vote was taken which it is proposed to consider. No question can be twice reconsidered, and a motion to reconsider cannot be amended, although it is debatable, and when debated it opens up for discussion the entire subject to be reconsidered. If the motion to reconsider is carried, the original question is in the condition it was in before the first vote was taken, and must be disposed of as if it had never been voted on. No one can debate the question reconsidered who had previously exhausted his right of debate on the question, although it is allowable to discuss it while the motion to reconsider is before the assembly.

The preliminary work of deliberative bodies is usually prepared by means of committees. These may be standing committees appointed for a definite time, select committees appointed for a special purpose, and committees of the whole consisting of the entire assembly. The first person named on a committee is usually the chairman, whose duty it is to call the committee together. A committee may facilitate its labors by the appointment of a subcommittee of its own membership. A committee report is usually made by the chairman, is signed by the members and delivered to the clerk. In case of disagreement among the members there may be a majority and a minority report. The report of the majority is the report of the committee, and it may be adopted by the assembly, rejected, or recommitted. After the report has been adopted the question is open to amendment as if there had been no committee report. An assembly may go into committee of the whole for the con-

sideration of a subject which it does not wish to refer to a committee but which it is desired to consider with the freedom and informality which characterize the procedure of committees. When this is done the presiding officer calls another member to the chair and takes his place as a member of the committee. During the consideration by committee of the whole no motions are in order except to amend and adopt or that the committee rise and report. Debate may be without limit unless the assembly votes that debate in committee shall cease at a certain time, and until then any member may speak as often as he can get the floor if no one else who has not had an opportunity to speak on the question claims it. When the debate is concluded a motion is made that the committee rise and report. This motion is always in order and is undebatable. When it is adopted the presiding officer of the assembly resumes the chair, while the chairman of the committee, having resumed his place in the assembly, reports to the chair the decision of the committee. Like other committees, the committee of the whole has no power to alter the text of any resolution referred to it. It is the practice of many deliberative assemblies to consider certain questions informally without going into committee of the whole, a procedure which is not very different from that of committee of the whole. This is the practice of the United States Senate in the consideration of measures on their second reading.

Debate upon a motion begins after it has been stated by the chairman and is closed by the chairman rising to put the question. If the presiding officer thinks the debate has ended, he inquires if the assembly is ready for the question, and if no one claims the floor he puts the question to a vote. The rule of the United States House of Representatives requires that those favoring the motion shall indicate their preference by saying Aye, and those opposing it say No. If when the presiding officer announces the result any member rises and expresses doubt as to the correctness of the result, or calls for a division, the presiding officer requests those who favor the motion to rise. After counting these and announcing the result, those opposed are requested to rise. These are counted and the final result is then declared. Or he may appoint tellers to make the count and report to him. Whenever there is a tie vote the motion is lost unless the presiding officer gives his vote for the affirmative. If his vote will cause a tie he may cast it and thus defeat the measure. Still another form of ascertaining the wish of members is the ballot. The following motions require a two-thirds vote for their adoption: amendment or suspension of the rules, making of special orders, objections to the consideration of a question, the demand for the previous question, and the closing or limiting of debate.

Consult: T. B. Reed, *Reed's Rules: A Manual of General Parliamentary Law* (Chicago, 1898); F. W. Hackett, *The Gavel and the Mace* (New York, 1900); H. M. Robert, *Rules of Order* (Chicago, 1901), the most convenient and in some respects the most authoritative manual of parliamentary law; E. A. Stevens, *American Law of Assemblies* (Minneapolis, 1901); Cushing and Bolles, *Manual of Parliamentary Practice* (Philadelphia, 1914). See AMENDMENT.

PARLIAMENT OF FOWLS, THE, or THE ASSEMBLY OF FOWLS. One of Chaucer's minor

poems, written in his favorite form of a vision. The poem is taken partly from Boccaccio's *Teseide* and alludes to other Italian sources, but is based mainly on Macrobius' *Commentary on Scipio's Dream*, a favorite book in the Middle Ages.

PARLOA, pär-lô'ä, MARIA (1843-1909). An American domestic economist, born in Massachusetts. She appeared in Boston as a lecturer on cooking in 1877, was special instructor, or lecturer, at various seminaries in Massachusetts and New Hampshire, and gave courses of lessons in sick-room cookery to Harvard medical students. In 1878 she visited Paris for study, in 1881 lectured in western cities, and in 1882 opened a cooking school in New York City. Her publications include: *Miss Parloa's New Cook Book and Marketing Guide* (1882; rev. ed., 1908); *The Young Housekeeper* (1894); *Home Economics* (1898; new ed., 1906); and other books of a similar nature.

PARLOW, pär'lô, KATHLEEN (1890-). A British violinist, born at Calgary, Alberta, Canada. When she was five years of age her parents removed to San Francisco, where she received her first musical instruction from Holmes, an English violinist, and a pupil of Spohr. Her progress was so rapid that in 1905 Holmes took her to London and exhibited her as a prodigy. She soon tired of such exhibitions, and her love for music was all but extinct when she heard Elman (q.v.). His playing revealed to her what true art was, and she at once proceeded to St. Petersburg to study with Elman's teacher, Leopold Auer (q.v.). After 18 months of hard work she made her début as a real artist in the Russian capital (1908). Her overwhelming success there was repeated upon her first tour of the United States in 1910, and subsequent visits confirmed the first impression. In spite of her youth she gained recognition as one of the masters of her instrument.

PARMA, pär'mä. Before 1860 a duchy in northern Italy, lying between Sardinia, Lombardy, Modena, and Tuscany. The city of Parma was one of the colonies established along the Æmilian Road by the Romans after the conquest of Cisalpine Gaul in 222 B.C. It was included in the Ostrogothic, Lombard, and Frankish kingdoms, and ultimately in the new German Roman Empire. In the eleventh century it was an appanage of Tuscany, and as such passed to the Countess Matilda. Lucchino Visconti, ruler of Milan, bought it from Obizzo d'Este about 1346. It passed, together with Milan, to the Sforza, and in 1499 was included in the conquests of Louis XII of France. In 1515, when Francis I reconquered Milan, he reannexed to it Parma and Piacenza, with the papal consent; but in 1521 it was retaken by the papal and Imperial troops. In 1545 Pope Paul III, one of the Roman house of Farnese, separated Parma and Piacenza from the papal domains and erected them into duchies for his natural son, Pietro Luigi Farnese, whose son, Ottavio, married Margaret, natural daughter of the Emperor Charles V. Pietro Luigi was assassinated in two years, and Parma and Piacenza were seized for the Emperor. Thereupon Paul III retracted his grant and resumed the papal claim. His successor, Julius III, who owed his election to the Farnese support, restored Parma to Ottavio Farnese. The Emperor retained Piacenza, and in 1551 sought to take

Parma, whereupon Ottavio sought the protection of France. Philip II, to secure his alliance against France in 1556, when Italy was menaced by a new French invasion, restored to him Piacenza, though a Spanish garrison remained there. Alessandro Farnese, son of Ottavio, entered the Spanish service and rose high in Philip's favor, and in 1585 the Spanish troops were withdrawn. Elizabeth Farnese, Queen of Philip V of Spain, in 1725 secured the reversion of Parma and Piacenza to her son, Don Carlos, who received them upon the death of the reigning Duke, Antonio, without issue, in 1731. Carlos exchanged them in 1735 with Austria for the Two Sicilies. In 1748 Parma and Piacenza, together with Guastalla, were handed over by Austria to the Spanish Bourbons in the person of the Infante Don Philip, with a reversion to Austria in case of failure to him of male descendants, or in case any of his descendants should ascend the Spanish or the Neapolitan throne. In 1801 Bonaparte concluded the Treaty of Madrid with Spain, by the terms of which Parma, Piacenza, and Guastalla were to be given to France on the death of Ferdinand, in exchange for which Don Luis, the son of Ferdinand, was made King of Etruria. France came into possession by the death of Ferdinand in the following year. The Treaty of Paris (1814) gave Parma, Piacenza, and Guastalla as a duchy to Maria Louisa, Napoleon's wife, and this was carried out, notwithstanding the protest of the King of Spain in behalf of the widow of the King of Etruria. On the death of Maria Louisa in 1847 the duchy reverted to Charles, Duke of Lucca, son of the King of Etruria, who succeeded as Charles II. Guastalla was given to Modena, and some small districts were added to Parma. The rule of Charles was tyrannical and illiberal. On the outbreak of the revolution in 1848 he was forced to grant the popular demands, but he soon afterward left the country. Parma joined Sardinia against Austria and was involved in the defeat of its ally. In March, 1849, Austria imposed upon Parma the rule of Charles III, son of Charles II, who had abdicated. The arbitrary rule of Charles III was closed by his assassination in 1854, when his widow, Louis Marie Thérèse de Bourbon, assumed the government in behalf of her son, Robert I. She made some attempt at reform, but left the country with her son on the outbreak of the War of 1859. On March 18, 1860, Parma was annexed to Sardinia and became a part of the new Kingdom of Italy by the will of its people. It now forms the two provinces of Parma and Piacenza.

PARMA. The capital of the Province of Parma, Italy, situated on both sides of the river Parma, 12 miles south of the Po and 75 miles southeast of Milan (Map: Italy, C 2). The town is circular in form and is surrounded by walls and ditches flanked by bastions. The site of the former fortifications is now nearly a complete circle of promenades. The streets are straight and wide and meet at right angles. The Roman Via Æmilia, here called the Corso Vittorio Emanuele, crosses the city from east to west, dividing it into two nearly equal parts. It traverses the Piazza Grande, where the official palaces and the statues of Correggio (1870) and Garibaldi (1893) stand. The northwest corner of the town is laid out in a fine public park. Here is situated the Palazzo del Giardino (1564), now a military school, con-

structed by the Farnese and containing frescoes by Carracci. Along the opposite side of the city extends the Stradone promenade.

Parma has over 60 churches, many of which are notable. The cruciform cathedral (erected 1064-74 and consecrated 1106) is built in the Lombard-Romanesque style. In the octagonal cupola is Correggio's "Assumption." Southwest of the cathedral is the baptistery (1196-1270), a splendid edifice of red and gray Verona marble. It is surmounted by several turrets, and the exterior is richly ornamented with symbolic tablets. In the interior is a series of good reliefs. The Madonna della Steccata (1521-39), the finest Renaissance church of Parma, is built in the form of a Greek cross and contains mural paintings by Parmigiano. The San Giovanni Evangelista (1510) is a fine Renaissance creation of eminent architects. The dome has noteworthy frescoes by Correggio, who has also here a valued "St. John the Evangelist."

The large but incomplete Palazzo della Pilotta (chiefly sixteenth and seventeenth centuries) owes its origin to the Farnese. In it are Parma's valuable art collections. In the museum of antiquities here are meritorious bronze statuettes. Its picture gallery contains good paintings by Giulio Romano, Canova's statue of Marie Louise, Holbein the Younger's "Erasmus," paintings and drawings by Parmigiano, and also famous examples of Correggio. Of these last the "Madonna della Scodella" is the most prominent. Other excellent works by Correggio are a "Descent from the Cross," a "Martyrdom of Sts. Placidus and Flacia," and the "Madonna di San Girolamo." The public library (Palatina) in the same edifice contains over 313,000 volumes and about 52,000 manuscripts, some of the latter of great interest and value. The Teatro Farnese, a wooden structure, is also here, dating from 1618 and latterly restored. In the convent of San Paolo, now used for a school, are found masterful frescoes by Correggio. The University of Parma was founded in 1512. There are faculties of jurisprudence, mathematics and science, and medicine and surgery. In 1912 the students numbered 406. Its paleontological collection and its African fauna from the Italian colonies are noteworthy. Connected with the university are a botanic garden, an observatory, and a pharmaceutical school. Among the other educational institutions of Parma are an Episcopal seminary, a lyceum, an agricultural institute, an academy of fine arts, and a school of music. The city is notable in art history as the place of residence of Correggio and the birthplace of Parmigiano.

Parma has manufactures of musical instruments, silks, woollens, linens, felt hats, leather, glass, and ironware. There is also a royal tobacco factory. The printing establishment founded by Bodoni in 1766 is famous in Italy. The trade is chiefly in wine, grain, cattle, and cheese. In June is held a silk fair. Pop. (commune), 1901, 49,340; 1911, 51,910; 1914 (est.), 53,781. Consult Irene Affò, *Storia della città di Parma* (9 vols., Parma, 1792-1859), and E. H. and E. W. Blashfield, *Italian Cities* (New York, 1912).

PARMA, ALESSANDRO FARNESE, PRINCE OF. See FARNESE.

PARMA, JEAN JACQUES RÉGIS CAMBACÉRÈS, DUKE OF. See CAMBACÉRÈS.

PARMA, MARGARET OF. See MARGARET OF PARMA.

PARMENIDES (Lat., from Gk. Παρμενίδης).

A Greek philosopher of the fifth century B.C. and the most famous member of the Eleatic school (q.v.). Little is known of his life, but he was greatly revered in antiquity for his intellectual powers and noble character. He is said, when 65 years old, to have visited Athens, where Socrates, then a young man, heard him. Like his master Xenophanes, Parmenides set forth his philosophical doctrine in verse, his work being entitled "On Nature" (Περὶ Φύσεως). Considerable fragments of it are still extant. The leading design of this poem is to demonstrate the reality of actual being, the nonexistence of which Parmenides declares to be inconceivable, but the nature of which, on the other hand, he admits to be equally inconceivable, inasmuch as it is dissociated from every limitation under which man thinks. As for the phenomena of nature, they are only apparent and due to man's error; they only seem to exist, but have no real existence. Apparently Parmenides made no attempt to grapple with the inevitable contradiction between the doctrine of being and that of seeming. The fragments are published by Karsten, *Philosophorum Græcorum Veterum Reliquiæ*, vol. i (Amsterdam, 1835); Stein, in *Symbola Philologorum Bonnensium* (Bonn, 1867); Ritter and Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913); Diels, *Parmenides' Lehrgedicht, griechisch und deutsch* (Berlin, 1897). Consult: Zeller, *Philosophie der Griechen*, vol. i (5th ed., Leipzig, 1892); Theodor Gomperz, *Greek Thinkers*, vol. i, English translation by L. Magnus (New York, 1905); H. Dills, *Die Fragmente der Vorsokratiker* (2d ed., Berlin, 1906); R. B. English, "Parmenides' Indebtedness to the Pythagoreans," in *Transactions of the American Philological Association*, vol. xliii (Boston, 1912); John Burnet, *Greek Philosophy: Part i, Thales to Plato*, vol. i (London, 1914).

PARMENION (Lat., from Gk. Παρμενίων) (c.399-329 B.C.). A Macedonian general, who served under Philip and Alexander the Great. In 356 he defeated the Illyrians, in 342 carried out a successful campaign in Eubœa, and in 337 was sent into Asia Minor to pave the way for the conquest of Persia. While he was there Philip was assassinated. Parmenion, his most trusted servant, remained faithful to Alexander and acted as his military adviser and was commander of the left wing at the battles of Granicus, Issus, and Gaugamela. In 330, when Parmenion was in Media guarding the booty, his son, Philotas, was accused of treason against Alexander and was executed, after having implicated his father. Alexander may have believed the charge or feared vengeance from Parmenion; at any rate he had him put to death.

PARMIGIANO, pär'mè-jä'nò, or **PARMIGIANINO**, pär'mè-jä-nè'nò, ANTONIO MAZZOLA (1503-40). An Italian painter named from his birthplace, Parma. He early came under the influence of Correggio and became a successful imitator of his style. In 1523 he went to Rome, where his first manner underwent great modification, through his study of the masterpieces of Michelangelo and Raphael. His Roman career was interrupted by the sack of the city in 1527 by the soldiers of Charles V. The picture of St. Jerome, National Gallery, London, was painted at this time. After his return to Parma in 1531 misfortunes overtook him, and the end of his life was spent in poverty.

He was the last of the real Renaissance painters in north Italy. Though spoiled by mannerisms, his decorative paintings show grace and refinement and his portraits considerable vigor. Good examples of the latter are at Naples, Vienna, Madrid, and Hampton Court. Parmigiano's principal altarpiece is "Santa Margherita," in the Academy at Bologna. His most popular production is probably "Cupid Making a Bow" (1536, Vienna), frequently attributed to Correggio. Consult Affò, *Vita del Mazzola* (Parma, 1784).

PARNAHYBA, pär'ná-ē'bá. A river of northeast Brazil. It rises in the Serra das Mangabeiras on the north boundary of the State of Goyaz, flows northeast for 800 miles between the states of Piauí and Maranhão, and empties into the Atlantic Ocean at the town of Parnahyba (Map: Brazil, J 4). It is navigable for small steamers through the larger part of its course.

PARNAHYBA. A town in the State of Piauí, northeast Brazil, near the mouth of the river of the same name (Map: Brazil, J 4). It is the commercial centre of the Piauí, carrying on an active trade in agricultural and cattle products. Pop. (est.), 12,000.

PARNASSIENS, Lēs, lä pär'ná'syän'. A school of French poets, so named because they contributed to a lyric anthology known as *Le Parnasse Contemporain*. One of the first Parnassiens to come forward was Théodore de Banville (1823-91), but the real founder of the school was Théophile Gautier (1811-72), who formulated the doctrine of art for art's sake. Gautier's unhappy friend Baudelaire (1821-67) upheld this poetic dogma, but he died rather too early to belong to the Parnassian school, save by his tendencies. Under the leadership of Leconte de Lisle (q.v.), in whose house they gathered on Saturdays as early as 1856, a score of writers composed poems wherein they endeavored to suppress personal feeling, to avoid preaching, and to cultivate art for art's sake. Leconte de Lisle himself was called the impassive, but in him, as in others, one often feels an emotional lyric undertone, and this bursts forth in a truly lyric cry in "Les Monstreux," a poem in which Leconte de Lisle utters his beliefs with a great lack of his habitual Olympic impassivity. The Parnassiens aimed at great finish in thought and form, and many of them achieved their aim. Xavier de Ricard, Anatole France, Catulle Mendès, Armand Silvestre, François Coppée, Sully Prudhomme, Léon Dierx, and José María de Heredia, to name the most distinguished Parnassiens, undertook also to rid French poetry of a false sentimentality, borrowed, they thought, from the Lake school (q.v.), and to combat the imitation of Lamartine.

PARNASSUS (Lat., from Gk. Πάρνασσός). A chain of mountains in Phocis, Greece. It has twin peaks, now called Gerantorachos and Lykeri (8070 feet), which rise from the rough surrounding plateau and form a conspicuous landmark in eastern Greece (Map: Greece, Ancient, C 2). During all but the summer months the summits are covered with snow. The Greeks called these twin peaks the Phædiades; of these peaks alone the Roman poets speak. From the plateau rise other lesser peaks, and on the side of a hill at the south above Delphi is the Corycian Cave, dedicated to Pan and the Muses. On the slope of Parnassus was the foun-

tain Castalia (q.v.), whose waters were supposed to fill the minds of those who drank of them with poetic inspiration. The *Thyiades* are said by Pausanias to have celebrated the orgies of Dionysus on the highest summits. On the southern slope lay Delphi (q.v.), the seat of the famous oracle of Apollo. Consult K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909).

PARNASSUS. A borough in Westmoreland Co., Pa., 17 miles northwest of Pittsburgh, on the Pennsylvania Railroad (Map: Pennsylvania, B 6). It contains a general hospital. Farming, lumbering, and some coal mining are carried on. Among the industries are manufactories of white lead, linseed oil, and car equipment. Pop., 1900, 1791; 1910, 2578.

PARNELL, CHARLES STEWART (1846-91). An Irish statesman and parliamentary leader. He was born at Avondale, County Wicklow, Ireland, June 27, 1846, of an old Protestant family. He was the son of John Henry Parnell, of English descent, and Delia Tudor Stewart, daughter of Rear Admiral Charles Stewart, of the United States navy. Parnell was educated at Magdalen College, Cambridge, but returned to Avondale without a degree. After traveling in the United States (1872-73) he became high sheriff of his county, and in 1875 he entered Parliament for Meath County. From the outset he displayed remarkable ability for leadership in politics and for parliamentary warfare. Reserved and dignified, with few of the ordinary graces of an orator, Parnell contrasted strikingly with the enthusiastic impulsive Irish debater of the type of O'Connell. But the very absence of these Irish qualities impressed upon the English the fact that now for the first time they had to reckon with a strong, well-directed Irish opposition.

In 1877, in conjunction with Biggar, Parnell brought together the hitherto disunited forces of opposition in a compact party of Nationalists, whose object was Home Rule for Ireland in all local affairs, including necessarily the restoration of the Irish Parliament. (See *HOME RULE*.) The method of political warfare followed by Parnell was bold and effective. He adopted extreme tactics of obstruction: to delay all public business as far as possible; to make combinations with any party that might be in opposition in order to embarrass the government; to use the balance of power in such a way as to secure concessions as the price of votes; and, in a word, to make all legislation extremely difficult until the demands of Ireland should be considered and accepted. For the support of this policy Parnell looked to the Fenians of Ireland and of America and to the Land League, which he helped organize in 1879 and of which he was the first president. The object of the league was not only to secure fair rents and to transfer the ownership of the soil to the tenants, but also to bring about Home Rule, by constitutional methods so far as practicable by force when necessary. (See *LAND LEAGUE*.) Meantime Parnell carried out his parliamentary warfare with singular tenacity and persistence, against the bitter opposition of both of the great English parties. The conservative traditions of the House of Commons were speedily set at naught: its rules were ingeniously perverted to defeat their own objects; every important piece of legislation was attacked, delayed, and in some cases defeated by the able combinations of the Irish party under

its great leader with some of the other elements of opposition. In 1877 and 1878 the Parnellites, as they began to be called, persistently opposed the bill for the annexation of the Transvaal, the flogging clauses of the Mutiny Act, and the Prisons Bill, and, joined by Joseph Chamberlain and leading Radicals, they carried the bill abolishing flogging in the army. Side by side with the development of this new policy the land agitation in Ireland grew and became a source of widespread public interest. To aid the movement and to relieve those tenants who suffered by eviction, Parnell in the winter of 1879-80 made a visit to America, where he raised large sums by popular subscription. On his return he was simultaneously elected to Parliament from Meath, Mayo, and the city of Cork, the last of which he chose to represent. His claim to lead his party was formally ratified when in May, 1880, the Irish members of Parliament chose him leader by a vote of 23 to 18. Supported by powerful social and political organizations and at last by the Catholic church, and controlling the words as well as the votes of his followers with a strong will and an iron hand, Parnell was now a formidable power in English politics. Continuing the land agitation, he was arrested and imprisoned in October, 1881, on the charge of intimidation and of obstructing the operation of the new Land Act. (See *IRISH LAND LAWS*.) He remained in Kilmainham jail until April, 1882, when he was released on parole.

At the general election of 1885 he was re-elected from Cork, and by a political bargain with the Conservative party secured the election of a number of Conservative candidates, though soon afterward he repudiated the agreement and threw his votes on the Liberal side (January, 1886), thus defeating the Conservative administration of Lord Salisbury. Gladstone, who by this change succeeded to office, was now definitely committed to the adoption of a measure of Home Rule for Ireland, and henceforth the Irish supported the Liberal party. On April 8, 1886, Gladstone had a bill introduced to give Home Rule, which ruptured the Liberal party and led to the formation of the Liberal Unionist party (see *LIBERAL UNIONISTS*), and Gladstone's administration was thereupon defeated and resigned in July, 1886. Nevertheless Parnell introduced a bill for the relief of tenants, which, as a whole, the Salisbury government refused to accept, though many of its important provisions were subsequently incorporated into the government's own measure. Towards the close of the session of 1887 a sensation was caused by the publication in the London *Times* of the facsimile of a letter purporting to have been written by Parnell to a friend, palliating the murder of the permanent Undersecretary for Ireland, Thomas Henry Burke, in Phoenix Park, Dublin, in 1882. On the night of the publication of this document Parnell returned to the House of Commons, from which he had been absent, and denounced the letter as a base and infamous forgery. But when Sir Charles Lewis, a Conservative, moved that the publisher of the *Times* should be prosecuted for libel at the expense of the government, the Irish members declined on the ground that they had no confidence either in the government or in English juries. Some time afterward this letter and others of a similar nature were found on investigation by a judicial commission (the Parnell Commis-

sion) to be the forgeries of a man named Richard Pigott, who after the exposure fled from the country and died at Madrid by his own hand. Parnell brought suit for libel against the *Times* and recovered £5000 damages. He was now at the very height of his prestige, but his downfall was near at hand.

For a long time rumors had been current in political circles connecting the name of Parnell with that of the wife of Capt. W. H. O'Shea, formerly member of Parliament for Galway and long an enthusiastic follower of Parnell. These rumors were confirmed when in 1889 Captain O'Shea applied for a divorce from his wife on the ground of adultery with Parnell. The case was tried in November, 1890, and, as no defense was made, the divorce was granted and Parnell was condemned in costs. This decision proved fatal to his reputation and political power. His offer to resign the leadership of the Irish party was at first declined, but soon it became known that Gladstone had written to John Morley that the continuance of Parnell's leadership would be disastrous in the highest degree to the cause of Ireland, implying that Parnell could no longer have the support and coöperation of the English Liberals. After this letter had been made public it was supposed that Parnell would renew his offer to resign. As he resolutely refused to give up the leadership, he was deposed by a vote of his parliamentary colleagues. The result was a division of the Irish party into Parnellites and Anti-Parnellites. The fallen leader now bitterly denounced both Gladstone and his own late colleagues who had turned against him. His appeal to the people, however, was answered by the defeat of three parliamentary candidates whom he had nominated. Nevertheless he struggled with desperate energy to recover his leadership till his health broke down completely in September, 1891. In July of that year he had married Mrs. O'Shea, and on the sixth of October following he died. See HOME RULE; IRELAND, *History*.

Bibliography. Hansard, *Reports*, 1875-91 (for his parliamentary speeches); H. W. Lucy, *Diary of Two Parliaments*, 1874-85 (London, 1885-86); id., *Diary of the Salisbury Parliament*, 1886-92 (ib., 1892); *Annual Registers* (ib., 1875-91); T. P. O'Connor, *The Parnell Movement, with a Sketch of Irish Parties since 1843* (New York, 1890); R. B. O'Brien, *Life of Charles Stewart Parnell* (ib., 1898); Justin McCarthy, *A History of our own Times* (5 vols., ib., 1901-05); James Bryce, *Studies in Contemporary Biography* (ib., 1903); John Morley, *The Life of William Ewart Gladstone* (3 vols., ib., 1903); Katherine O'Shea, *Charles Stewart Parnell: His Love Story and Political Life* (ib., 1914).

PARNELL, HENRY BROOKE, first BARON CONGLETON (1776-1842). A British politician born in Ireland. He studied at Eton and at Trinity College, Cambridge, and in 1797 entered politics as an anti-Unionist member of the Irish House of Commons. Two years after the Act of Union (1800) he was elected to the British Parliament for Queen's County, which, with an interval of four years (1802-06), he continued to represent until 1832, when he declined to stand again. The next year he was elected from Dundee, which he continued to represent from that time until his elevation to the House of Lords as Baron Congleton of Congleton in 1841. He became Secretary of War in Earl Grey's

Liberal cabinet in 1831, but was dismissed the next year for refusing to support the ministry on the Russo-Dutch War question. His chief interest was in financial and agrarian subjects, and in 1838 he strongly urged the abolition of the Corn Laws. He wrote a number of works, including: *Observations upon the State of Currency of Ireland* (1804; 3d ed., 1804); *An Historical Apology for the Irish Catholics* (1807); *A History of the Penal Laws against the Irish Catholics, from the Treaty of Limerick to the Union* (1808); *Treatise on the Corn Trade and Agriculture* (1809); *On Financial Reform* (1830; 4th ed., 1832); *A Treatise on Roads* (1833; 2d ed., 1838).

PARNELL, THOMAS (1679-1718). An Anglo-Irish poet, born in Dublin. He graduated at Trinity College, Dublin, and was ordained deacon, though under the canonical age. In 1706 he was appointed Archdeacon of Clogher, in 1713 prebendary to St. Patrick's Cathedral, Dublin, and in 1716 vicar of Finglas. He contributed to the *Spectator* and *Guardian* and was the associate of Swift, Pope, Arbuthnot, and Gay in the Scriblerus Club. On the fall of the Whig government, near the close of Anne's reign, he went over to the Tories and stood in high favor with the Oxford administration. But his prospects of advancement from that quarter were destroyed by the overthrow of the Tories on the death of the Queen. His disappointment at not obtaining better promotion, and the death of his wife (1711), threw him into deep melancholy, and he is said to have hastened his death by intemperance. He died at Chester in October, 1718. Besides the occasional papers written for Addison and his share in *Scriblerus*, Parnell helped Pope in the translation of the *Iliad*, and contributed to the first volume an *Essay on the Life, Writings, and Learning of Homer* (1715). His poems were collected by Pope in 1721. The volume contains 20 poems, among which are "The Hermit," "The Fairy Tale," "A Night Piece on Death," and "A Hymn to Contentment." In 1758 appeared the *Posthumous Works of Parnell*. The volume adds nothing to his fame. Consult the *Life of Parnell* by Goldsmith, and the edition of Parnell's poems by Aitken in the Aldine Series (London, 1804).

PARNY, pär'né', ÉVARISTE DESIRÉ DESFORGES, VISCOUNT DE (1753-1814). A French poet born in the Isle of Bourbon. In his childhood he went to Paris, became a soldier, and in 1773-75 he revisited his native land and there loved a Creole, whose praises he sang in the *Poésies érotiques* (1778). His later epics have less literary merit. They are frivolous and obscene. Of these *La guerre des dieux anciens et modernes* (1796) is characteristic. His *Works* were published at Paris in 1808 in five volumes. The latest edition of his *Poésies complètes* appeared in 1887.

PAROCHIAL SCHOOLS. This term is employed to designate those elementary schools which are maintained by certain denominations and are organized on the basis of parishes. (See PARISH SCHOOL.) These schools are the outcome of a desire to provide a system of education which does not neglect the religious aspects which are regarded by the denominations maintaining such schools as the true foundation of a good education. They are thus a protest against the complete secularization of the public schools. The only parochial school system in the United States that is making rapid progress

is that maintained by the Roman Catholic church, which claims that since its schools relieve the country of the financial burden of educating the children of its faith, their parents should at least be exempted from that part of their taxes which go to education. A similar protest is also made by the Lutheran church, and in 1911 the German Missions Synod attempted to secure legislation which would relieve Lutherans of the tax now paid for the maintenance of secular schools. These two denominations, the Roman Catholic and the Lutheran, present the chief examples in the United States of well-developed parochial school systems.

Roman Catholic Church. The Roman Catholic church has always asserted the right to educate the young, believing that intellectual, moral, and religious education form an inseparable whole and provide the only true basis for good citizenship. Accordingly education was regarded as one of the principal tasks of the church wherever a settlement of Catholics sprang up in America. Education always formed the subject of discussion at the plenary and provincial councils of the church throughout the nineteenth century. The most important of these in the development of parochial schools was the Third Plenary Council, held at Baltimore, in 1884. Here Catholic parents were urged and commanded to send their children to schools of their own faith to procure for them "a truly Christian and Catholic education and to defend and safeguard them from the dangers of an education merely secular during the entire period of childhood and youth." The council provided for the supervision of schools and the training and certification of teachers. Since that date the parochial system has shown remarkable progress and vigor, as is evidenced by the fact that, while in the first decade of this century the Catholic population showed an increase of 35 per cent, there was an increase of 40 per cent in the number of pupils in parochial schools. In 1900 there were 3812 parochial schools, 4972 in 1910, and 5256 in 1913, with an enrollment of 1,360,761 pupils. It is estimated that the cost of maintaining these schools is over \$11,000,000, raised by voluntary contributions. While the per capita charge is low, it must be noted that the great majority of the teachers are members of religious congregations. It is claimed for the church that it would cost the country to accommodate the pupils now attending parochial schools \$84,325,450, without the cost of maintenance.

The parochial schools are organized on a diocesan basis under the charge of the bishops. Assisting the bishops are either school boards of priests appointed by them or, according to an increasing practice, diocesan superintendents. The functions of the superintendents are very similar to those of superintendents of other school systems. They are responsible for the courses of studies, textbooks, school regulations, certification of teachers, inspection and examination of schools, and for presenting annual reports to their bishops or school boards. Where superintendents are not employed their functions are performed by the school boards; in other cases the school boards stand in an advisory and legislative capacity to their superintendents. The superintendents are assisted in their work by school visitors or examiners and by inspectors of communities, the latter being concerned with the teachers of their own order

or community. Each school is under the supervision of the parish priest, assisted by a board of laymen.

Apart from religious instruction the schools aim to give the same type of curriculum as is usually found in the public elementary schools. The teachers belong for the most part to teaching congregations and receive their training during their novitiates. For the improvement of teachers in service there are, in addition to the regular systems of supervision and inspection, summer schools conducted by the congregations, institutes, summer schools provided by colleges and universities, and in 1911 a teachers' college was established at the Catholic University of America for the higher education of women teachers.

In addition to the elementary schools the church is gradually developing a system of high schools. In 1911 it was reported that from 400 to 500 parochial schools were giving high-school work to older pupils; but this work was not organized and was largely an individual matter. Since 1911 a movement has been in progress to provide central high schools to serve the needs of several parishes. It is intended that such schools shall be independent of the parishes and under the direct control of the bishops as diocesan institutions. Another movement looking to the better organization of Catholic high schools is in the direction of securing their articulation and affiliation with standard colleges. Thus, since 1912 some 50 schools have in this way become affiliated with the Catholic University of Washington.

The general interest and progress of education in the church are promoted by the Catholic Educational Association, which was organized in 1903 and has several departments devoted to different branches of the work.

Lutheran Church. The history of parochial or congregational schools of the Lutheran church in this country has been continuous since the days of the first German settlers. While congregational schools flourished everywhere until the development of the public-school system, they are now to be found mainly in the North Central States. Their function is regarded as twofold: (1) to afford a religious basis for education and promote the faith, and (2) to transmit the language and culture of the countries of origin of the members. The schools are established and maintained by the individual congregations or by school societies within the congregations. While no compulsion is exercised, members of the congregations are expected to send their children to congregational schools by preference, and moral suasion is employed to this end and also to secure funds for the maintenance of the schools. While it is common to charge tuition, there is a movement to abolish this practice. The schools provide in general the same curriculum as the public schools, with the addition of religion and a foreign language (German, Norwegian, Swedish, etc., according to the nativity of the congregants). The majority of teachers are men, women sometimes being employed in the primary grades. Seven teachers' seminaries are maintained to train instructors. A large number of pastors, however, are also engaged in teaching, and all assist in the schools in a supervisory capacity. In 1913 the church had 5883 schools, attended by 272,914 pupils, or only 22.4 per cent of the child population of

the church. The slowness of progress of the Lutheran parochial schools is perhaps due to lack of funds for schools that will compare with the public schools and in no small degree also to the fact that the immigrants, on whom the schools rely, soon turn to the public schools. To remedy this a large number of supplementary schools are conducted, some on Saturdays, some several days in the week, to provide religious instruction to pupils attending the public schools. Besides the elementary schools a large number of academies, colleges, and theological seminaries are maintained by the denomination.

Consult: J. A. Burns, *The Catholic School System in the United States* (New York, 1908); P. J. McCormick, "Roman Catholic Parochial Schools," and W. H. T. Dall, "Progress and Condition of Lutheran Parochial Schools," in *United States Bureau of Education, Report of the Commissioner, 1913*, vol. i (Washington, 1914); *Why Lutheran Schools?* (St. Louis, 1912).

PARODY, pār'ô-dī (Lat. *parodia*, from Gk. *παρωδια*, *parody*, from *para*, *para*, beside, beyond + *ὄδῳ*, *ôdô*, song, ode, from *ἀείδω*, *acideîn*, *âdeu*, *adeîn*, to sing. A parody is something sung (set) beside, i.e., in imitation of, something else). As understood by the Greeks in early times, a parody was a comic imitation of a serious poem or of some part of it, but the term came to be applied also to the comic imitation of any variety of prose, such as history or fiction. Parody, like travesty, is a form of burlesque. The essence of burlesque is the treatment of a light theme in the style appropriate to a serious work. Such, e.g., is Chaucer's *Nun's Priest's Tale*, wherein the hubbub caused by Master Reynard in the widow's household is described in language suggestive of the fall of Troy. The humor lies in the contrast between subject matter and the treatment of it. In the travesty, such as the clever *L'Enéide travestie* of Paul Scarron (q.v.), the characters of the original are turned to a humorous account by some change in the incidents that results in a debasement of the original theme. In the parody the theme and the characters are greatly modified or completely changed, but the style of the original is closely followed in those peculiarities that easily lend themselves to ridicule.

Though the word "parody" has come to us from the Greeks, it is not to be supposed that they were the first people to feel the impulse towards this kind of satire. Parody belongs to the folk literature of many races, perhaps of all races. In very early literary stages writers have laid hold of contemporary legal and religious phrases for giving a humorous turn to the common affairs of life. All that can be said is that the parody as a distinct literary type of satire has been handed down from the Greeks, giving form to the folk parodies of the Western nations. Contemporary with or hard upon the epic and dramatic poetry of Greece came the parodists of those two forms of art. The first Greek parodist, according to Aristotle, was Hegemon of Thasos (fifth century B.C.), who gained a prize at the Athenian games with his *Gigantomachia*, or *Battle of the Giants*. By others the invention of the form has been ascribed to Hipponax (q.v.) (sixth century B.C.). But these are doubtful traditions. At any rate, the best extant parody of the epic among the Greeks is *The Battle of*

the Frogs and the Mice, running closely on the lines of a Homeric combat. (See *BATRACHOMYOMACHIA*; *MARGITES*; *RHINTHON*.) The great master of parody was Aristophanes (q.v.), the great comic poet of Athens into whose comedies were taken over whole passages of Euripides and many current phrases for the purpose of ridicule. Aristophanes was followed first by the writers of the New Attic Comedy—Menander, Philemon, Diphilus, etc.—in whose writings parody abounds. A master of parody was Lucian (q.v.), who in *The Dialogues of the Gods* freely employed the language of Homer and in *The True History* built up an extravagant romance on incidents from the *Iliad* and contemporary tales of adventure. Parody is very common in Plautus (q.v.), whose comedies are based on those of the New Attic Comedy. That the Romans were fond of parody is known also from Cicero, who in his *De Oratore* enumerates its several kinds. Horace, in several passages of his *Sermones*, parodies the epic effectively. Catullus was a favorite with the parodist; and Vergil did not escape. The Roman *Metamorphoses* of Ovid (q.v.) is a prolonged burlesque of the epic myths.

Among the Romans are found the first parodies of the legal testament, or will. It was a custom as early as the time of Julius Caesar for men to satirize their enemies by scurrilous remarks about them in their wills. Out of the practice seems to have grown the humorous testament, in which some animal, a pig or an ass, bequeathes at death his property or qualities to posterity. These animal testaments, of which the earliest one extant goes back to the third century of our era, spread through the Latin races, appearing in French, Spanish, and Portuguese during the early Renaissance. A good example is the *Testamentum Porcelli* (*The Last Will and Testament of a Little Pig*), which can be found in Peck-Arrowsmith, *Roman Life in Latin Prose and Verse* (New York, 1894). Akin to them are the many imaginary testaments written on various occasions in later times. A fine specimen is *The Will* by John Donne, the Elizabethan poet. Closely related to the humorous testament is also the parody on the epitaph, which goes back to the Middle Ages. This kind of satire is seen in its perfection in the *Ballade des pendus* of François Villon, composed in anticipation of the gallows. Indeed, both the Lesser and the Greater Testament of Villon are parodies so excellent in their kind as to form a type. Almost equally famous is Goldsmith's *Retaliation* on the imagined death of his friends, including Burke, Garrick, and Reynolds.

For centuries the most fruitful source of parody was the Bible and the liturgy of the Christian Church. This was, of course, in line with the work of Lucian, though it was at first in no direct way connected with him. From the twelfth century onward, increasing greatly during the Reformation period, flourished parodies of the mass, the creed, the litany, the paternoster, and prayers and hymns to the Virgin. They were sometimes written in Latin and at other times in the vernacular speech. In *Cynthia's Revels* Ben Jonson introduces a light parody of the litany, and Lord Somers, who framed the Declaration of Rights, parodied the first four chapters of St. Matthew. In 1817 William Hone, a London author and bookseller, was prosecuted for publishing parodies on the

litany, the Athanasian Creed, and the catechism, which he had employed for political satire. These are but a few examples taken from a class numbering hundreds.

The purely literary parody, aiming at good-natured banter, though not unknown to the ancients, is mainly a modern development from the harsh invective of the earlier times. It has long been expected that a popular poet or novelist will have his peculiar style and way of viewing things held up to ridicule. So kindly is this ridicule that not even the most sensitive author can receive other than pleasurable emotions from it. Shakespeare amused his audiences with the rant of the contemporary drama and the cuphuism of John Lyly, and evidently was not hurt when friends like Beaumont and Fletcher paid him in his own coin. In more than one instance Shakespeare even parodied himself. A parody of the inferior and dead or moribund mediæval romances was Cervantes' *Don Quixote*, which was completely adopted into English literature. The bombast and nonsense of Dryden's tragedies received their just castigation in the Duke of Buckingham's *Rehearsal* (1672). Among the parodies of Milton the *Splendid Shilling* of John Philips (died 1708) is still reckoned the best. Passing by Gray, Goldsmith, and Cowper, each of whom had his parodist, we come to the nineteenth century, the age *par excellence* of parody. The first romantic group of English poets, including, among others, Wordsworth, Keats, and Shelley, were especially exposed to ridicule. Then came Tennyson and Browning with marked mannerisms, and finally the so-called Pre-Raphaelites, like Rossetti, William Morris, and Swinburne, with their florid imaginations, distorted female figures, and unreal landscapes. There could be no finer material for the parodist. In their *Rejected Addresses* (1812) Horace and James Smith burlesqued deliciously Wordsworth, Southey, Byron, and Scott. Following in the line of the Smiths are R. H. Barham's *Ingoldsby Legends* and the *Bon Gaultier Ballads*, the joint work of W. E. Aytoun and Theodore Martin. Among other clever verse parodists were Thomas Hood, W. M. Thackeray, C. S. Calverley, Lewis Carroll, Sir Frederick Pollock, J. K. Stephen, and the numerous contributors to *Punch*, who have closely watched for absurdities of sentiment and style. From this list should be selected Calverley as undoubtedly the most felicitous parodist in the whole range of English literature. Especially successful was he in imitating Tennyson's *The Brook* and Browning's *The Ring and the Book* in *The Wanderers* and *The Cook and the Bull*. And the eccentricities of the Pre-Raphaelites are finely exaggerated in the *Ballad*.

The English novel began its career with parody. Richardson had no sooner published *Pamela* than humorous continuations were placed upon the market. All of them are now forgotten except Fielding's *Joseph Andrews*, which begins with ridicule of Richardson's point of view and a close parody of his epistolary style. Sterne was likewise the sport of a score of humorists. Before publishing *Vanity Fair* Thackeray paid his compliments to Bulwer, Disraeli, Lever, and G. P. R. James, and afterward to Scott. The mine opened by Thackeray in these *Burlesques* was further worked by Bret Harte in two series of *Condensed Novels* dealing with the older novelists and Mrs. Humphry

Ward, Anthony Hope, Sir Arthur Conan Doyle, Hall Caine, and Kipling. In like manner Sir Owen Seaman in *Borrowed Plumes* (1902) burlesqued Mrs. Craigie, Miss Fowler, Marie Corelli, George Meredith, Maurice Hewlett, Henry James, and other novelists of the day. His deftness in this genre is exemplified also in *The Battle of the Bays* (1896). Barry Pain, too, may be remembered by his *Playthings and Parodies* (1892). Mention should also be made here of Max Beerbohm's *A Christmas Garland* (1913), composed of clever parodies of some 20 of his contemporaries, including George Meredith, Henry James, Rudyard Kipling, Arnold Bennett, Joseph Conrad, H. G. Wells, George Moore, and Bernard Shaw. These are genuine parodies, as contrasted with mere burlesques. In them the author not only catches the tricks of style of his victims, but would seem for the moment even to identify himself with their minds and points of view.

Parody has been considerably cultivated by American writers with at least fair success. Of Colonial parodists the most important is doubtless Joseph Green of Boston, the witty rival of Mather Byles, the punning parson. The Revolutionary satirists naturally made use of parody, a good illustration being John Witherspoon's parody of the *Petition* of Rivington, the Tory printer. After the Revolution the Hartford Wits essayed parody and the mock-heroic in *The Echo* and *The Anarchiad*. The absurdities of the Della Crusceans and the pretensions of the new Democratic-Republican party furnished materials to parodists and satirists, but the first elaborate parody of real consequence, Irving's *Knickerbocker's History of New York*, changed under its author's hands into a masterpiece of humorous narration. With the next generation came authors original enough to be parodied not only in America but in England; e.g., Willis, Longfellow, and Poe. It was even found worth while to parody, in a volume modeled on the *Rejected Addresses*, versifiers whose names are now scarcely remembered. The Civil War gave an impetus to the writing of parodies. Some clever ones are to be found in the works of professed humorists like D. R. Locke (Petroleum V. Nasby) and R. H. Newell (Orpheus C. Kerr), but the most important and sustained is Richard Grant White's *New Gospel of Peace*. Of recent years Walt Whitman is naturally the writer who has best lent himself to parody. Bret Harte (q.v.), mentioned in the preceding paragraph, and Bayard Taylor, in *The Echo Club and Other Literary Diversions*, are probably the most important writers of parody with regard to both quantity and quality. Carolyn Wells, an anthologist of parodies (see below), is also a writer of parodies of various English poets and notably of Fitzgerald's Omar Khayyam in *The Rubáiyât of Bridge* (1909).

Bibliography. For Greek: W. E. Hope, *The Language of Parody: A Study in the Diction of Aristophanes* (Baltimore, 1906); Christ-Schmid, *Geschichte der griechischen Litteratur* (5th ed., 2 vols., Munich, 1908-13; 6th ed., vol. i, part i, 1912). For the early history with its bibliography, J. O. Delepierre, *Essai sur la parodie* (London, 1871). A popular history of parody with examples from modern literature is given by A. S. Martin in *On Parody* (New York, 1896). For a larger collection, consult Walter Hamilton, *Parodies of the Works of English and American Authors* (London, 1884-89), and Caro-

lyn Wells (comp.), *A Parody Anthology* (New York, 1904). Some good specimens of recent verse parody may also be found in A. H. Miles, *The Poets and Poetry of the Nineteenth Century*, vol. ix (ib., 1907), in Jerrold and Leonard, *A Century of Parody and Imitation* (ib., 1913), and in other anthologies. See BURLIQUE; TRAVESTY.

PAROL, pá-ról' (Fr. *parole*, word, from Lat. *parabola*, parable). In English and American law, primarily something said or spoken as distinguished from something expressed or set forth in writing. It is in this natural sense of the term that it is used to distinguish oral or spoken from written evidence of a transaction or occurrence. See EVIDENCE, *Parol Evidence Rule*.

In the law of contracts, however, the term "parol" is used of any statement or term of an agreement, whether oral or written, which is not under seal and which therefore requires a consideration for its validity. The expression "parol contract" is accordingly equivalent to "simple contracts." See CONTRACT.

By statute or by the common law many acts and transactions are required to be in writing in order to have legal validity. Among these are wills, conveyances of land, legislative acts, or statutes, and certain classes of contracts. See FRAUDS, STATUTE OF.

PAROLE. In penal law, a pledge of good conduct given by a person convicted of crime as a condition of exemption or release from confinement in prison. The parole system, as it is called, has in recent years been established in most of the United States as an important feature of a widespread and comprehensive movement in penal reform. It is based on the principle that, as prison life affords little or no real opportunity for demonstrating the capacity of a convict to lead an honest and decent life in a state of freedom, and as the leading of such a life by an ex-convict is beset with many difficulties, it is desirable that the State should retain a certain control and exercise some supervision over him for a time after his release. Accordingly a person who has been sentenced to an indeterminate period of imprisonment, as is now the usual practice, may be released on parole before the maximum limit of his term has been reached, either on the expiration of the minimum term or of some other shorter term fixed by statute, on condition of good behavior. The release in such case is not an absolute discharge, such as he receives as a matter of right on the expiration of his full term, but is conditional on the due performance of his pledge. For a violation of his parole within the time limited he is liable to be apprehended and returned to prison to serve out his full or maximum term. During the parole period he is required to report from time to time to the prison authorities or to a parole agent or parole officer to whose custody he was committed when released.

In most States the power of releasing a prisoner on parole is vested in a board of parole, which acts in a judicial capacity, visiting the prisons or other penal institutions from which applications for release have been received, examining the applicants, inquiring into their prison records, and in general determining their fitness for parole. In practice most persons confined under the maximum-minimum sentence now generally imposed are released at the ex-

piration of the minimum term for which they were sentenced or other shorter term fixed by law, unless their conduct while in prison has been conspicuously bad or unless they have incurred the ill will of the prison officials. The tendency of recent legislation in the United States is to fix a short minimum term, especially for first offenders and for all but the most serious offenses.

There are no trustworthy statistics as to the effect of the parole system upon the life of the convict after his release, but it is generally believed that the conditional character of the discharge and the supervision, slight as it is, to which the paroled prisoner is subjected have a beneficial effect in many cases. The system is still in a crude and undeveloped state. With improved methods of supervision and a more sympathetic and helpful attitude on the part of the community to which the paroled convict is released, the parole system should prove an important agency in the rehabilitation of the convict population. See IMPRISONMENT; INDETERMINATE SENTENCE; PENOLOGY; PROBATION; PUNISHMENT.

PAROLE (Fr. *parole*, word, from Lat. *parabola*, comparison, speech, parable). In its military sense the word "parole" is used to designate two different things: 1. With reference to guards the parole is a word, usually the name of a general or other distinguished person, used as a check on the countersign, usually the name of a battle, in order to obtain more accurate identification of persons. The parole is important only to those who are entitled to inspect guards and to commanders of guards. The parole or countersign or both are sent sealed in the form of an order to those entitled to them. With reference to this kind of parole the 44th Art. of War, United States Army, states: "Any person belonging to the armies of the United States who makes known the watchword to any person not entitled to receive it, according to the rules and discipline of war, or presumes to give a parole or watchword different from that which he received, shall suffer death or such other punishment as a court-martial may direct." 2. In international law, the pledge of honor of a prisoner of war by which he engages, if given his freedom, to observe certain conditions imposed by his captor. The pledge usually required is not to serve again against the government holding him or against its allies during the war. The release of prisoners of war on parole came into vogue with the disappearance of the old right of the captor to hold such a prisoner indefinitely for ransom, but only in the case of officers and even then only under exceptional circumstances. With a view to encouraging the practice and checking its abuse The Hague Conference of 1899 enacted a convention (Articles x, xi, and xii) defining its conditions and regulating its exercise. These articles provide in substance that prisoners of war may be set at liberty on parole if the laws of their country authorize it; that prisoners so released are bound on their personal honor scrupulously to fulfill the conditions of the parole; that in such case the government of the released prisoner shall not require of nor accept from him any service incompatible with the parole given. If a government disapproves of the parole given, it becomes the duty of the paroled person to return himself to captivity. A paroled prisoner who is recaptured bearing arms against

the government to which he has pledged his honor or against its allies forfeits his right to be treated as a prisoner of war and may be brought before the military courts of his captor. It is also expressly provided that there is no obligation on a government to release a prisoner on parole nor on a prisoner to accept release on such terms as may be offered him.

The laws of most countries place no restriction on the right of its soldiers to secure release on parole, but in the American and British armies paroles can be given only through a commissioned officer except in cases of extreme hardship. In the nineteenth century prisoners were sometimes paroled within certain limits, such as a town, in order to lighten the burden of captivity.

Notwithstanding the burden which the custody of a large number of prisoners of war involves for the captor, release on parole is still rarely practiced. Obviously the pledge of a soldier not to engage again in hostilities against his country's enemy is not regarded as adequate security against his doing so, even though the breach of parole is, in case of recapture, usually punished with death.

Consult: J. B. Scott, *Texts of the Peace Conferences at The Hague, 1899 and 1907* (Boston, 1908); *Instructions for the Government of Armies of the United States in the Field*, section vii, "The Parole," in Scott (*supra*), appendix; A. P. Higgins, *The Hague Conferences and Other International Conferences* (New York, 1909); J. M. Spaight, *War Rights on Land* (London, 1911). See INTERNATIONAL LAW and references there given; PRISONERS OF WAR.

PAROL EVIDENCE. See EVIDENCE.

PARONYCHIA, pār'ô-nîk'i-â, or WHITLOW. An inflammation, generally superficial, beginning at the root of a nail and attended by pain and suppuration. See FELON; NAIL.

PAROQUET, pār'ô-kët. See PARAKEET.

PA'ROS (Lat., from Gk. Πάρως). An island of the Cyclades, in the Grecian Archipelago. It is situated west of Naxos, from which it is separated by a channel from 4 to 6 miles wide (Map: Greece, Ancient, D 3). The greatest length of the island, 15 miles; greatest breadth, 9 miles; area, about 95 square miles. Pop., 1907, 3586. The island is chiefly a mountain mass, rising in the centre, in the ancient Marpessa, now Mount St. Elias, to a height of nearly 2500 feet. In the valleys the vine and grain are cultivated, but the chief importance of the island in ancient times was due to the marble, and especially the highly esteemed lychnites, which was much sought by sculptors. Parikia, on the west coast, on the site of the ancient Paros, is the principal town. Ancient tradition attributed the early colonization of the island to Cretans, who called it Minoa; later it was settled by Ionians. It early enjoyed prosperity from its marble and its numerous sculptors. Later it submitted to Persia, and was unsuccessfully attacked by Miltiades after the battle of Marathon. After the Persian wars it joined the Delian League and shared the fortunes of the neighboring islands. Like others of the Cyclades it passed under the rule of the Ptolemies of Egypt, and in 197 B.C. was presented to the Athenians by Rome. Since then it can scarcely be said to have had a separate history. It was celebrated in literature as the native place of the poet Archilochus, and is known also from the discovery of the famous Parian Chronicle. See ARUNDEL MARBLES; CHRONICLE OF PAROS.

PAROTID GLAND. See SALIVARY GLAND.

PAROTITIS, pār'ô-tî'tis. See MUMPS.

PARQUETRY (Fr. *parqueterie*, from *parquet*, a finely joined floor, dim. of *parc*, park). Inlaid or mosaic flooring, formed of pieces of wood from ¼ inch to 1½ inches thick, fitted together in rectilinear patterns much larger in scale than the designs of marquetry (q.v.). Sometimes wainscots and walls are paneled in parquetry. The use of parquet flooring first became common in France in the period of Louis XIII. See INLAY; MOSAIC; TILE.

PARR (so called probably from the parr marks or crossbars on the sides). A young salmon before its first migration to the sea and when its sides still show indistinct bars. Cf. SMELT; see SALMON.

PARR, CATHARINE (1512-48). The sixth and last Queen of Henry VIII of England. She was the daughter of Sir Thomas Parr, of Kendal, Westmoreland. Married first to Lord Burgh and afterward to Lord Latimer, she was wedded, not without misgivings, to Henry VIII on July 12, 1543. She was distinguished for her learning and knowledge of religious subjects. Her influence was for good; she persuaded Henry to restore the right of succession to his daughters; wished to educate them and Prince Edward, and interested herself on behalf of the universities. In 1544, during the absence of Henry at the siege of Boulogne, she acted as Regent of the Kingdom. After Henry's death she married (1547) Sir Thomas Seymour, and died after childbirth the following year. Consult Agnes Strickland, *Lives of the Queens of England* (Philadelphia, 1902-03).

PARR, MRS. LOUISA (maiden name TAYLOR) (c.1848-1903). An English novelist, born in London. She passed her early life in Cornwall. Marrying a physician in 1869, she settled at Kensington. Before this she had written a story entitled *How it All Happened* (in *Good Words*, 1868). This graceful story, translated into French, appeared also in the *Journal des Débats*. Her first three-volume novel, *Dorothy Fow* (1871), was well received. But she first gained her audience with *Adam and Eve* (1880), which depicted with faithfulness the quaint fishing village of Polperro in Cornwall. Among subsequent novels are *Loyalty George* (1888); *The Squire* (1892); *Can This Be Love?* (1896).

PARR, SAMUEL (1747-1825). An English scholar, born at Harrow-on-the-Hill. He was sent to Emmanuel College, Cambridge, in 1765, but the death of his father two years afterward compelled him to withdraw and to accept an assistant mastership at Harrow, where he remained five years. In 1776 he was appointed master of Colchester School, where he was ordained priest and obtained the curacies of Hythe and Trinity Church. Next year he became master of Norwich School, but in 1786 settled at Hatton in Warwickshire, where he spent the rest of his life. In 1787 he published an edition of Bellenden, to which he prefixed his celebrated preface, which is as remarkable for its uncompromising advocacy of Whig principles as for the scrupulous Ciceronianism of its Latinity. Parr was a man of vast learning, but his scholarship was not of high order. Consult De Quincey's essay, *Dr. Samuel Parr on Whiggism in its Relations to Literature*.

PARR, THOMAS (c.1483-c.1635). An English centenarian, known as Old Parr. In 1635 he was brought by the Earl of Arundel to London

and presented at court as then 152 years of age. He was exhibited in London, where he excited both scientific and popular curiosity. He died the same year on November 15, and the following day Dr. William Harvey, discoverer of the circulation of the blood, made an autopsy, found the body in singularly good condition, and attributed Parr's death to the London climate and the change from a simple to a rich diet. Parr was long a favorite chapbook character, but assertions of his extreme age have been investigated and doubted by W. J. Thoms and Sir G. C. Lewis. The value of the latter's opinion is somewhat impaired by his expressed disbelief in the existence of properly proved cases of centenarians, many of which are on record. The chief source of information concerning Parr is a curious pamphlet by John Taylor, entitled *The Olde, Olde, very Olde Man* (1635). Consult "Sir G. C. Lewis and Longevity," in *The Fortnightly Review* (London, April, 1869).

PARRAKEET (Fr. *perroquet*, from Sp. *periquito*, dim. of *perico*, parrot, from *Pedro*, Lat. *Petrus*, Gk. Πέτρος, Peter, from πέτρος, rock; also explained as from It. *parrocchetto*, dim. of *parroco*, parish priest, jestingly applied to the bird). Any of many small kinds of parrots, especially the long-tailed East Indian and Australian species of the genus *Palæornis* and its allies. The American parakeets are chiefly of the genus *Conurus*. One species of a closely related genus was formerly found within the limits of the United States and not elsewhere. At the beginning of the nineteenth century the Carolina parakeet (*Conuropsis carolinensis*) was found throughout the eastern and central United States as far north as Nebraska, Wisconsin, and central New York. It was not merely a summer visitor, but appeared also in winter, so that it was remarkably hardy for a parrot. At the beginning of the twentieth century the species was almost extinct, and survived only in the most inaccessible parts of Florida and Indian Territory, and at present it has probably entirely vanished, except for a few specimens in captivity. It is a beautiful bird, and also noisy, gregarious, and tame, so that it has been an easy victim. It is a trifle more than a foot long, bright green in color, with the head and neck yellow, forehead, cheek, and bend of wings orange. It feeds on seeds, nuts, etc., and is very destructive to fruit. On account of the damage it did in orchards it was ruthlessly killed in early days. Its nesting habits have never been authentically described, and there is some dispute as to whether its eggs are laid in a hole in a tree as is customary with parrots. One of the most beautiful groups, combining gracefulness of form with splendor of plumage, is that to which the Alexandrina or ring parakeet (*Palæornis alexandri*) belongs. This bird is about the size of a common pigeon, green, with a red collar, and is a native of the East Indies. It is said to have been brought to Europe by Alexander the Great's expedition to India, and to have been the first parrot known to the Greeks and Romans, by whom it was highly prized, as it still is, not only for its beauty, but for its docility and its power of imitating human speech. Immense flocks live in some of the coconut groves of western Ceylon and fill the air with deafening screams. The ring parakeet has many congeners, natives chiefly of the East Indies, which exhibit much variety of splendid plumage, among which the East Indian rose-

ringed (*Palæornis torquata*) is one of the most familiar; its general color is green, the neck of the male ornamented with a rose-red, black-edged collar.

Much like them in length and form of tail, but with longer and stronger legs, is the small ground parakeet (*Pezoporus terrestris*) of Australia and Tasmania. This bird inhabits thickets and runs much on the ground, but occasionally takes a short low flight. It makes no nest, but lays its eggs in a hole in the ground. Its colors, dark green above and yellowish below, are less brilliant than in many of the parrot tribes, but the bird is finely marked and mottled. Its flesh has a very strong game flavor. There are numerous other Australian species, distributed in several genera, some of which exhibit great splendor of plumage. Most familiar is the grass, shell, or zebra parakeet (*Melopsittacus undulatus*), a very beautiful little bird, which has long been one of the favorite cage birds in all parts of the world and often sells under the dealers' name budgerigar (q.v.). It is small, slender, and long-tailed. It has a yellow head, with three black cheek spots surmounted by a blue patch; the back is yellow, with black transverse markings; the wing quills brown, with green outer webs and yellow margins; the rump and under parts green, the tail green, bounded with yellow, but with the two central quills blue. (See Plate of PARROTS.) Of *Platyercus* and closely allied genera there are over 50 species. These are found throughout Australia and are the commonest varieties exported. In the vast inland plains of Australia these parakeets are to be seen in flocks of many hundreds feeding on the seeds of the grasses, which afford food also to many other small grass parakeets, such as those of the genus *Euphema*, or *Neophema*.

PARRAL, pär-räl', or HIDALGO DEL PARRAL. A city of the State of Chihuahua, Mexico, on the Parral, 120 miles south of Chihuahua (Map: Mexico, F 4). The town possesses very old and productive silver mines and is now the centre of one of the most important mining regions of Mexico. It is in the midst of the wine-making district of Mexico. A United States consular agent is stationed here. Pop., 1900, 14,748; 1910, 14,067.

PARRAMATTA, pär'-mät'tä. A town in Cumberland County, New South Wales, Australia, situated on the Parramatta River, 14 miles northwest of Sydney, with which it is connected by steamer and railway (Map: New South Wales, F 3). It is the centre of an extensive fruit-growing district and has an important tweed factory, government buildings, hospital, homes for the infirm and indigent, and a beautiful and well-cultivated pleasure ground (the old Domain), in which was situated the Government House, inhabited by the state's earliest rulers. Formerly called Rosehill, Parramatta is, with the exception of Sydney, the oldest town in Australia. The first grain raised in the state was grown here and the first grants of land were here made. Here is the oldest grammar school in Australia. Pop., 1911, 12,465.

PARRAS DE LA FUENTE, pär-räs dâ lä fwân'tä. A town of the State of Coahuila, Mexico, situated near the east shore of Lake Parras (Map: Mexico, H 5). The town lies in a fertile valley and is surrounded by orchards and vineyards. Its chief manufactures are wines and raisins. Pop., 1900, 6,476; 1910, 6,252.

PARRATT, SIR WALTER (1841-). An English organist and composer, born at Huddersfield. His first organ appointment, at a church near Huddersfield, was received when he was only 11. The next year he was appointed organist of St. Peter's Church, London, and studied with George Cooper. In 1854 he returned to Huddersfield, coming to be in great request for organ recitals throughout the north of England. In 1861 he accepted an appointment at Worcester, where he was also private organist to the Earl of Dudley. In 1872 he became organist of Magdalen College, Oxford. On the retirement of Sir George Elvey as the organist of St. George's Chapel, Windsor, Parratt was appointed to fill the vacant position. He was knighted by the Queen in 1892, received the appointment of private organist to her Majesty, and the following year became master of the Queen's music. Under King Edward VII he occupied the corresponding offices. In 1908 he succeeded Sir Hubert Parry (qv) as professor of music at Oxford. His compositions, while not numerous, are of a high order of merit. They include music to the *Story of Orestes*, many anthems and services, and a few songs. Parratt edited *Choral Songs by Various Writers and Composers* (1889) and contributed 10 important articles to *Grove's Dictionary of Music and Musicians* (1879-89).

PARRHASIUS (Lat., from Gk. Παρρῆσιος). One of the greatest painters of ancient Greece, the son of Evenor, himself an artist. He was a native of Ephesus, but, like his elder contemporary Zeuxis, practiced his profession in many places and seems to have received Athenian citizenship as a reward for his picture of Theseus, since later writers sometimes call him an Athenian. He lived near the end of the fifth century B.C. Certainly apocryphal is the story of Seneca that for his painting of Prometheus he tortured a captive from Olynthus, as the artist could scarcely have been living at so late a date (347 B.C.) if he were a celebrated painter during the lifetime of Socrates, over 50 years before. (Cf. Xenophon, *Memorabilia*, iii, 10.) His art is known to us only from ancient criticism and chiefly from a passage in Pliny, *Hist. Nat.*, xxxv, 67, where he is praised as the first to introduce accurate proportions into painting and as especially successful in his drawing and rendering of contours. It seems that he was the first successfully to employ light and shade in such a way as to suggest the round as distinguished from the relief. His painting of the Athenian Democracy (*Demos*) was held to express in a wonderful way the variety of disposition which marked that very variable person.

PARRICIDE (Lat. *parricida*, OLat. *paricidas*, murderer of his parent, of a magistrate, or of a free citizen, assassin, probably from *par*, equal + *oedere*, to kill; associated in popular etymology with *pater*, father). One who kills his father, or a man who stands in the place of a father, as a father through adoption. The term is derived from the Roman law, where the crime of *parricidium* included the murder of many near relatives besides the father, as a grandfather, son, brother, sister, and others. By the *lex Pompeia de Parricidiis* (52 B.C.), the murder of an ascendant, as a father or grandfather, or of a son, was punished in most severe manner, the parricide being sewed up in a leather sack, along with a live dog, viper, cock,

and ape, and cast into the sea or a near-by river. In England and the United States the punishment of a parricide does not differ from that of any other murderer. Consult the authorities referred to under CIVIL LAW; CRIMINAL LAW. See MURDER.

PARRIS, SAMUEL (1653-1720). A New England clergyman. He was born in London, went in youth to Massachusetts, and studied at Harvard College, but did not graduate. After being a successful merchant in Boston, he entered the ministry and was pastor of the church at Danvers, Mass. (then a part of Salem), in 1689-96. He is remembered from the fact that the delusion of Salem witchcraft originated in his family in 1692, his daughter and his niece accusing Tituba, a South African slave living as a servant in the family, with bewitching them. Parris beat her and compelled her to confess herself a witch. The delusion and persecution thus commenced lasted 16 months. Mr. Parris having been a zealous prosecutor in the witchcraft cases, his church brought charges against him. He acknowledged his error, but was dismissed. He preached afterward at Stow, Concord, and Dunstable. Consult his *Life* by Fowler (Salem, 1857), and the bibliographies of SALEM and WITCHCRAFT.

PARRISH, EDWARD (1822-72). An American pharmacist, born in Philadelphia and member of a family of physicians. Graduating from the College of Pharmacy (Philadelphia) in 1842, he engaged in the active practice of his profession. In the College of Pharmacy he was made professor of materia medica in 1864 and in 1867 professor of practical pharmacy. He is best known through a nonofficial preparation, the compound syrup of phosphate of iron, popularly known as Parrish's chemical food. He was president of the American Pharmaceutical Association in 1868. He published: *An Introduction to Practical Pharmacy* (1856, 5th ed., 1884); *The Phantom Bouquet* (Philadelphia, 1863); *Education in the Society of Friends* (ib., 1866).

PARRISH, MAXFIELD (1870-). An American illustrator, painter, and decorator, son of Stephen Parrish. He was born in Philadelphia and studied at the Pennsylvania Academy of Fine Arts and at the Drexel Institute under Howard Pyle. Although he traveled widely in connection with his profession, he never studied abroad. He soon became known for his original decorative posters and richly colored designs for magazine covers. His work shows an unfailing fertility of invention, combining delightful fantasy with joyous, whimsical humor. It is especially happy in its reflection of the child imagination, picturing incomparably, e.g., the events of the Arabian Nights. The execution is careful as to details, yet broad in handling, delicate and sure in line; the color, laid on in flat, cleverly considered masses, is softly rich and glowing. Among the most important books illustrated by him are: Kenneth Grahame's *The Golden Age and Dream Days*; Eugene Field's *Poems of Childhood*; *Mother Goose in Prose*; Irving's *Knickerbocker History of New York*; Mrs. Wharton's *Italian Gardens*. As time went on Parrish devoted himself increasingly to mural decoration. His notable achievements in this art include the well-known "Old King Cole" in the Knickerbocker Hotel, New York, decorations in hotels in Chicago and San Francisco, and an important series of 17

panels, completed 1912, for the building of the Curtis Publishing Company, Philadelphia. In 1906 Parrish was elected to the National Academy of Design, and he became a member of the National Institute of Arts and Letters. He made his home at Cornish, N. H.

PARRISH, STEPHEN (1846-). An American landscape painter and etcher, the father of Maxfield Parrish. He was born in Philadelphia. At first a business man, later he took up etching and then painting. His first plate appeared in 1879. Among his paintings are "Low Tide," "Evening," and "The Road to Perry's Peak." His subjects are usually large, open expanses of country—often winter scenes—treated with much poetic feeling. His etchings, which are sincere and powerful and have frequently been exhibited in Europe and America, include the series "Cape Ann to Marblehead" and other American seaboard scenes. Fine examples are in the New York Public Library and collections of prints elsewhere.

PARROCEL, pá'rô'sél'. A family of French painters, the first of whom was **BARTHELEMY** (c.1600-c.60), a painter of religious subjects—The most important was **JOSEPH** (1646-1704), the battle painter, born at Brignolles. He studied under his elder brother, Louis, and also under Le Bourguignon in Rome, and was made a member of the French Academy of Fine Arts in 1676. He is said to have known nothing of actual soldiering, but he had a vigorous brush and considerable skill in composition. There are pictures by him in the Louvre and at Versailles. He also left numerous rather inferior etchings after his own designs.—Other painters of this name were his son, **CHARLES** (1688-1752), a battle painter, who depicted the campaigns of Louis XV; his nephew, **PIERRE** (1670-1730), whose subjects were mostly religious; and **IGNACE FRANÇOIS** (1704-81), son and pupil of Pierre, an historical and genre painter.

PARROQUET. A variant spelling of parakeet (q.v.).

PARROT (probably from Fr *Perrot*, *Pierrot*, dim. of *Pierre*, Peter). A bird of the group Psittaci or the order Psittaciformes, which is related to the cuckoos and plantain eaters. It was formerly divided into two families, the Psittacidae and Trichoglossidae, but the latest revision increases this number to six, Nestoridae, Loridae, Cyclopsittacidae, Cacatuidae, Psittacidae, and Stringopidae. The order includes 83 genera and about 625 species and subspecies. Most of them are natives of the tropics and especially of the Australian and Malayan regions. There are 50 species in Australia, and over 100 species occur in New Guinea alone. South America has more than 160 species, and Africa and southern Asia the remainder. Few inhabit or even enter the temperate zone, the most northerly one, perhaps, being the now nearly or quite extinct Carolina parakeet (q.v.) of the United States. The determining feature in the family is the beak, which is short, stout, and greatly arched, the upper mandible hooking over the lower and movably hinged to the skull. The feet are short and strong, and the toes are two before and two behind. The wings are likely to be rather short and in some groups rounded; and the tail may be short and broad, as in the true parrots, or very long and pointed, as in the parakeets, noticeably broad in others, and so on. Most parrots are gaudily colored, but some are soberly clad; and there is likely to be a crest—very

prominent in the cockatoos and less so in some others—or other modifications of the feathers of the head, as in the facial disks of the owl parrots or kakapos. (See KAKAPO.) The sexes are usually much alike.

Most parrots are forest birds, although a few are of terrestrial habits and are styled ground parrots, and a few others, like the grass parakeets, inhabit grassy or brushy plains. As a rule, also, they are gregarious, and many species go in large flocks. Their food with few exceptions is vegetable—plantains, papaw apples, figs, and tamarinds being varied by flowers, buds, leaves, palm nuts, and other hard fruits, grass seeds, and grain. This supplies so much moisture that little drinking seems necessary. Exceptional foods are the bulbs and tubers for which cockatoos dig, while some species search the bark of trees for insects, or extract honey and insects from flowers with their brush-tipped tongues. (See LOBY.) Lastly, the kaka (q.v.) has acquired a taste for flesh. Most parrots gather their food by climbing about the branches like the nimblest of acrobats, using their beaks freely in support of their bodies, and manipulating their food with their claws as no other bird ever does.

The voices of parrots, as a rule, are harsh, and the great macaws and cockatoos scream most discordantly. Some, however, utter low and sweet twittering notes. Many have great facility in imitating other sounds or human speech, and some learn to articulate words and phrases with much distinctness, if given patient training. There is a popular notion that this process may be aided by slitting the tongue—a practice as useless and foolish as it is barbarous. It is not certain that the tongue has anything more to do with the enunciation of parrots than in the case of other birds, where it plays no part in utterance. The tongue is always large, round, and fleshy. In the subfamily Nestorinae (the kakas) it is fringed, and in lorics it has a brush of hairs towards the tip.

The typical and perhaps the best-known parrot is the African gray parrot (*Psittacus erithacus*) of equatorial Africa, which is ashy gray, with black wing quills, a red tail, and whitish, naked face. It is in high esteem among most of the African tribes, who rear it from the nest as a house pet, enjoy its flesh, and seek its feathers as ornaments, some setting apart the red tail feathers for their chiefs as insignia of rank. Long ago these parrots were carried to Europe, and afterward to all parts of the world, and have shown themselves not only hardy, long-lived, and affectionate, but the clearest talkers of the whole tribe. A closely allied but much darker West African species has less ability in the learning of words and phrases. In their native wilds these parrots go about in flocks during the day and return at night to certain "roosts." They eat various fruits and nuts, especially palm nuts. They breed in holes in trees, often in companies, and aid one another in defending their homes. All parrots nest in holes in trees except a few aberrant ones, like some in New Zealand, which lay their eggs in holes or hollows of the ground or among rocks. All lay white eggs. Fossil representatives of this tribe carry its history back to the Lower Miocene age.

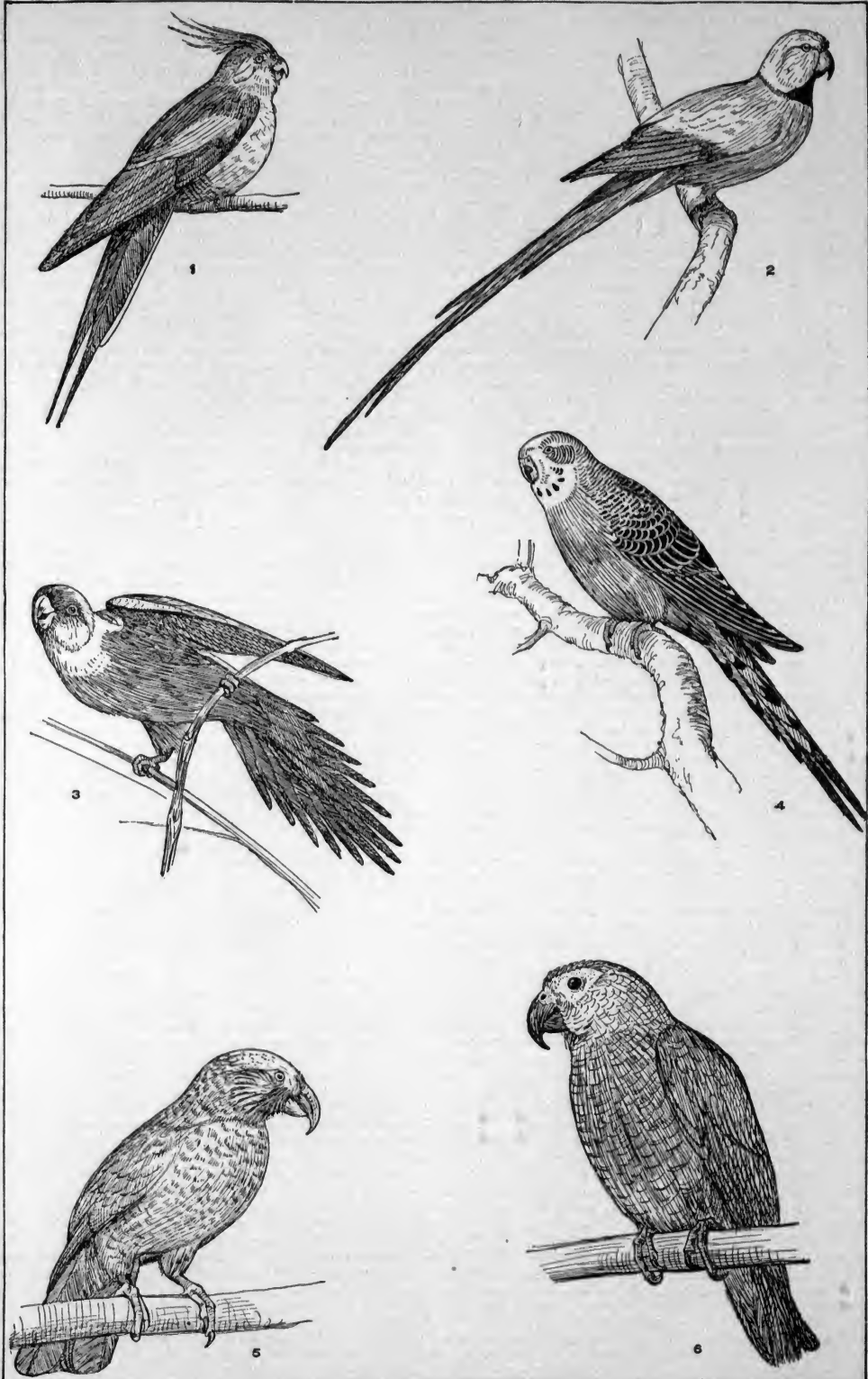
Bibliography. The standard work on the subject is that by A. T. Salvadori, *Catalogue of the Psittaci or Parrots in the Collection of the*

PARROTS



1 LESSER LEMON-CRESTED COCKATOO - CACATUA SULPHUREA	1/2	NATURAL SIZE
2 PENNANT'S BROAD-TAILED PARAKEET - PLATYCERCUS ELEGANS	1/2	"
3 GRAY-HEADED MADAGASCAR LOVE BIRDS - AGAPORNIS CANA	1/2	"
4 PURPLE-CAPPED LORY - LORUS DOMICELLA	1/2	"

PARROTS AND PARRAKEETS



1. COCKATEEL (*Calopsitta novaehollandiae*).
2. ROSE-RINGED PARRAKEET (*Palæornis torquata*).
3. CAROLINA PARRAKEET (*Conuropsis carolinensis*).

4. BUDGERIGAR (*Melopsittacus undulatus*).
5. KAKA (*Nestor meridionalis*).
6. AFRICAN GRAY PARROT (*Psittacus erithacus*).

British Museum (London, 1891); also John Gould, *Birds of Australia* (7 vols., ib., 1840-48); J. P. Selby, "Parrots," in William Jardine, *Naturalists' Library*, vols. ix, x (ib., 1866); W. T. Greene, *Parrots in Captivity* (3 vols., ib., 1884-87); Alfred Newton, *Dictionary of Birds* (New York, 1893); A. H. Evans, *Birds* (ib., 1900); Hutton and Drummond, *Animals of New Zealand* (London, 1905); C. N. Page, *Parrots and Other Talking Birds: Their Food, Care, and Training* (Des Moines, 1906). See Colored Plate of PARROTS; Plate of PARROTS and PARAKEETS; Plate of COCKATOOS and MACAWS.

PARROT FISH, or LORO. Any of many species of the family Scaridae, particularly of the genus *Scarus*. The form is oblong and massive, with large scales. They are fishes of brilliant colors in general, and some have wonderful splendor and have received their name partly on this account and partly on account of a fancied resemblance in their jaws to a parrot's bill. They are mostly herbivorous, some feeding on corals, and are not good food fishes. Most of them are natives of the tropical seas. One species in the Mediterranean (*Scarus creticus*) is the scarus of the ancients. Several species inhabit tropical American waters and are known in the West Indies as loros, viejas (i.e., old wife), guacamaías, etc. The name is given in 'Australia' to *Pseudoscarus pseudolabrus*, called parrot perch. In Victoria and Tasmania there are also several species of *Labrichthys*.

PARROTT, ROBERT PARKER (1804-77). An American soldier and inventor of ordnance, born at Lee, N. H. He graduated at West Point in 1824 and was assigned to the artillery. Until 1829 he remained at the Military Academy as an instructor, then performed garrison duty for several years, and in 1836 saw service against the Creek Indians. He was promoted to be captain of ordnance early in the same year, but resigned in October to become superintendent of the West Point Iron and Cannon Foundry at Cold Spring, N. Y., a position which he held until 1867. While there he invented the famous Parrott cannon used by the Federal army and navy during the Civil War. Captain Parrott was first judge of the Court of Common Pleas in Putnam County from 1844 to 1847, and was superintendent of schools at Phillipstown from 1848 until 1856. See ORDNANCE.

PARRSBORO, pärz'bür-ô. A town and the county seat of Cumberland County, Nova Scotia, Canada, on the Basin of Minas and on the Cumberland Railway and Coal Company Railway (Map: Nova Scotia, F 5). Several steamship lines connect it with other Nova Scotian ports. It is an important coal and lumber shipping point. Its industrial establishments include shipbuilding yards, woodworking plants, and others. The town owns its electric-lighting plant and water works. Pop., 1901, 3391; 1911, 2856.

PARRY, CHARLES CHRISTOPHER (1823-90). An American botanist, born in Worcestershire, England. He was educated at Union College and afterward practiced medicine in Davenport, Iowa. His study of the botany of the district resulted in his appointment to the geological survey of the Northwest (1848), then to the survey of the Mexican boundary (1849-52), and he was successively botanist to the Pacific Railroad survey of the thirty-fifth parallel and to the Department of Agriculture from 1867 to

1871. His publications include: *Botanical Observations in Western Wyoming* (1874); *Botanical Observations in Southern Utah* (1875); *Revision of the United States Pacific Coast Species of Arotostaphylos* (1883); *Revision of the Genus Chorizanthe* (1884); *The North American Genus Ceanothus* (1888).

PARRY, pär'l, SIB (CHARLES) HUBERT HASTINGS (1848-). An English composer and musical scholar, born at Bournemouth, Feb. 27, 1848. At the age of seven he was sent to a private school at Malvern. His earliest attempts at music, in the form of chants and hymn tunes, date from this time. In 1860 he was sent to Twyford School and took lessons from the village organist; while there he came under the influence of Samuel Sebastian Wesley, the organist of Winchester Cathedral. In 1861 he entered Eton. He studied composition under Elvey and often acted as composer, organist, or vocalist for the musical society of the college. In 1867 he entered Exeter College, Oxford. He obtained in 1874 his degree of master of arts and took advanced study in music under Bennett and Macfarren, together with an extended course under Dannreuther. After three years in a business house, and against the wishes of his family, Parry devoted himself entirely to music. He was appointed choragus of Oxford University in 1883 and in the same year was granted the degree of musical doctor by Cambridge, followed in 1884 by Oxford and in 1891 by Dublin. In 1891, also, he became professor of composition and history of music at the Royal College of Music and in 1894 its director, succeeding Sir George Grove. From 1900 to 1908 he was professor of music at Oxford. He was knighted by Queen Victoria in 1898, and at the coronation of Edward VII, in 1903, was created Baronet. Although his *Intermezzo Religioso* for string orchestra was produced at the Gloucester Festival of 1868, he remained practically unnoticed until 1880, when Dannreuther played his piano concerto in F sharp minor and when his *Scenes from Shelley's Prometheus Unbound* was heard at the Gloucester Festival. From then on until 1907 Parry produced every year some larger work at one of the English festivals. Some English critics regard him not only as the greatest figure in modern English music, but as the greatest since the days of Purcell (q.v.). But the fact remains that Parry's works have not been able, so far, to secure a foothold outside of his native land. His principal works are the oratorios *Judith* (1888), *Job* (1892), *King Saul* (1894); five symphonies in G, F, C, E minor, B minor; incidental music to Aristophanes' *Birds*, *Frogs*, and *Clouds*, *Æschylus' Agamemnon*, and Ogilvie's *Hypatia*; a great deal of chamber music; six books of *English Lyrics*. His reputation, however, rests chiefly upon his great choral works with orchestra, of which the following are the more important: *The Glories of our Blood and State* (1883); *Blest Pair of Sirens* (1887); *Ode to St. Cecilia's Day* (1889); *Allegro ed il Penseroso* (1890); *War and Peace* (1903); *The Pied Piper of Hamelin* (1905); *The Soul's Ransom* (1906). His writings, which exhibit sound scholarship and original thought, include: *The Evolution of the Art of Music* (1896); *The Seventeenth Century* (1902), being the third volume of the great *Oxford History of Music*; *Style in Musical Art* (1912). In addition he was one of the most

Sp., Portug., It. *pastinaca*, from Lat. *pastinaca*, parsnip, from *pastinum*, a sort of two-tined dibble), *Pastinaca*. A genus of annual, biennial, and perennial herbs of the family Umbelliferae, with carrot-like fleshy roots and pinnate leaves. The common parsnip (*Pastinaca sativa*), a native of Europe and northern Asia, is a biennial, with angular-furrowed stems 2 to 3 feet high, ovate leaflets, white roots, which are aromatic, mucilaginous, sweet, but slightly acrid. Cultivation has greatly modified the qualities of the roots, rendering them much more bland and greatly increasing their size and fleshiness, thus improving their edible qualities. The parsnip delights in a very open rich soil, but will succeed in clayey soils far too stiff for the carrot. The mode of cultivation of the parsnip scarcely differs from that of the carrot. The parsnip is used chiefly in winter, whether for the table or for feeding cattle, for which it is highly valued, especially in Europe. It is improved rather than injured by frost, but is apt to become acrid after it has begun to grow again in the spring. The cut-leaved parsnip or sekakul (*Pastinaca sekakul*, or *Malabaila pumila* of some botanists), with pinnatifid cut leaflets, a native of India, Syria, and Egypt, cultivated in the Levant, is very similar in its uses to the common parsnip. The wild form, devoid of the thickened root, is a weed in the northeastern United States and adjacent Canada. See Plate of ONIONS, OYSTER PLANT, ETC.

PAR'SON (OF. *persone*, Fr. *personne*, from ML. *persona*, person, curate, parson, Lat. *persona*, person, actor's mask). Strictly, one who has full possession of all the rights of a parochial church, as the representative or impersonator of the Church, which is an invisible body. The term is used loosely for any clergyman.

PARSON BIRD, or TUI. The mimic of the New Zealand bush and the possessor of a beautiful natural note (*Prosthemadera nova-zelandia*, of the family Meliphagidæ). Its plumage is black, excepting two small outgrowths of white feathers, one on each side of the throat, which



THE PARSON BIRD

suggest the bands of a clergyman in a Geneva gown. Consult Buller, *Birds of New Zealand* (2d ed., London, 1888), and Hutton and Drummond, *Animals of New Zealand* (ib., 1905). See Plate of CREEPERS.

PARSONS. A city in Labette Co., Kans.; 137 miles south by west of Kansas City, on the Missouri, Kansas, and Texas and the St. Louis and San Francisco railroads (Map: Kansas, G 8). The State hospital for epileptics is situated here, and among other prominent structures are the high school, the Missouri, Kansas, and Texas railroad depot, Mathewson Hotel, the business college, Carnegie library, Federal building, Masonic Temple, Elks Theatre,

and the railroad Y. M. C. A. There are two fine parks, Forrest and Glenwood. The Missouri, Kansas, and Texas maintains here general offices and extensive car and machine shops. The industrial establishments include flouring and feed mills, grain elevators, creameries, a foundry, chicken-feed factories, nurseries, skirt and shirt factories, etc. Natural gas is used generally for fuel and lighting. Founded and incorporated as a third-class city in 1871, Parsons became a city of the second class in 1873. The government is administered by a mayor and four commissioners. Pop., 1900, 7682; 1910, 12,463; 1914 (U. S. est.), 14,500.

PARSONS. A borough in Luzerne Co., Pa., adjoining Wilkes-Barre on the north, and on the Delaware and Hudson and the Central of New Jersey railroads. Coal mining, oil refining, and the manufacture of tinware and silk goods are the leading industries. Pop., 1900, 2529; 1910, 4338.

PARSONS, ALFRED WILLIAM (1847-). An English landscape painter, born at Beckington (Somerset). He worked for two years as a post-office clerk in London, studying art in the evening at the South Kensington Schools, then took up painting as a profession and worked by himself from nature. He first exhibited at the Royal Academy in 1871. Equally proficient in oil, water color, or black and white, Parsons excels in depicting rural English simplicity; but in all his landscapes, whether of America, Japan, or Britain, he preserves the particular charm of the country. His sketches are peculiarly expressive and significant and his style distinctively individual, fresh, and graceful. His works include "When Nature Painted All Things Gay" (1887, Tate Gallery), "A Mid-May Morning," "The First Frost," and "The Village by the Links." He received a gold medal at Paris in 1889 and two medals at Chicago in 1893. His illustrations include those done with E. A. Abbey for *Old Songs* and *A Quiet Life*; *The Warwickshire Avon*; *Wordsworth's Sonnets*; *Notes in Japan*; and *The Danube from the Black Forest to the Black Sea* (1891, with F. D. Millet). He became president of the Royal Water Color Society and was elected Royal Academician (1911).

PARSONS, CHARLES (1821-1910). An American landscape painter and illustrator, born in Manchester, England. He studied at the National Academy of Design, New York, early became associated with illustrated journalism, and afterward worked in lithography, his landscapes and views of New York City and harbor being particularly noteworthy for their finished workmanship. From 1861 until 1889 he had charge of the art department of Harper and Brothers, New York. Parsons also painted landscapes and marines in water color. He was elected an associate of the National Academy of Design (1862) and a member of the American Water Color Society.

PARSONS, SIR CHARLES ALGERNON (1854-). An English inventor and shipbuilder, fourth son of William Parsons, third Earl of Rosse (q.v.). Educated at St. John's College, Cambridge, of which he became honorary fellow, Parsons was elected to the Royal Society in 1898, became high sheriff of Northumberland, and received the K.C.B. in 1911. He was proprietor of the engineering and electrical works, C. A. Parsons and Co., at Heaton, Newcastle, and head of the Parsons Marine Steam Turbine

Company and of two electrical-supply companies. His inventions include: nonskid chains for automobile tires, an auxetogramophone in 1898; and the compound steam turbine known by his name, introduced about 1884, improved by a condenser in 1891, and adapted for maritime use on the *Turbima* in 1897. About 1910 he invented a geared turbine. He published *The Steam Turbine* (1912), the Rede Lecture for 1911. See STEAM TURBINE.

PARSONS, CHARLES LATHROP (1867-). An American chemist, born at New Marlboro, Mass. He graduated from Cornell University in 1888 and from 1890 to 1911 was professor of chemistry at New Hampshire College. In the latter year he became chief mineral chemist of the Bureau of Mines at Washington, D. C. Parsons was awarded the Nichols medal in 1904 for research on the atomic weight of beryllium and in 1911 received the honorary degree of Sc.D. from the University of Maine. His publications include: *Mineralogy, Crystallography, and Blowpipe Analysis* (1895; 5th ed., 1911), with A. J. Moses, *Beryllium: Its Chemistry and Literature* (1908); *Fuller's Earth* (1913).

PARSONS, FRANK (1854-1908). An American political scientist, born at Mount Holly, N. J. He graduated at Cornell in 1873 and in 1892 became lecturer on law at Boston University. From 1897 to 1900 he was professor of history and political science at the Kansas Agricultural College and became professor of political science and dean of the College of Liberal Arts, Ruskin University. He wrote: *The World's Best Books* (1889, 3d ed., 1893), *Our Country's Need* (1894); *The Drift of our Time* (1898), *The New Political Economy* (1899), *The Bondage of Cities* (1900); *The City for the People* (1899, rev. ed., 1901), *The Story of New Zealand* (1904), *The Heart of the Railroad Problem* (1906); *The Railways, the Trusts, and the People* (1906).

PARSONS, HERBERT (1869-). An American political leader, born in New York City. He graduated at Yale in 1890, studied at the University of Berlin in 1890-91 and at the Harvard Law School in 1891-93, and was admitted to the bar in 1895. He was a member of the New York board of aldermen in 1900-03, and from 1905 to 1911 was Republican Representative from the thirteenth New York district. From 1905 to 1910 he was chairman of the New York County Committee, and he was largely instrumental in the latter year in bringing about the nomination of Charles E. Hughes as Republican candidate for Governor of New York. In 1914 he supported the candidacy of Charles S. Whitman for Governor of New York and in 1915 was delegate at large to the New York Constitutional Convention.

PARSONS, JOHN EDWARD (1829-1915). An American lawyer, father of Herbert Parsons. He was born in New York City, graduated from the University of the City of New York in 1848, and was admitted to the bar in 1852. He participated in the conduct of many important lawsuits and was counsel until 1910 and director until 1911 of the American Sugar Refining Company (the "Sugar Trust"). He became a director of the Metropolitan Trust Company, was one of the founders of the General Memorial Hospital, served as president of the Woman's Hospital, and was also identified with the work of Cooper Union.

PARSONS, or PERSONS, ROBERT (1546-

1610). An English Jesuit and controversialist, born at Nether Stowey, Somersetshire, educated at Oxford, elected fellow of Balliol (1568) and subsequently dean (1574). In 1574 he left Oxford, proceeded to Louvain, and was received into the Roman Catholic church, joining the Jesuits (1575) and ordained priest (1578). In 1580 he was sent with Edmund Campion to England to help the secular clergy. He issued, in conjunction with Campion, many pamphlets, among which were *A Brief Discourse Containing Certain Reasons why Catholics Refuse to Go to Church* (1580), and Campion's more famous *Decem Rationes* (1581). In 1581 Campion was caught and executed, but Parsons escaped to Normandy. His great energies were now devoted to the restoration of the Catholic church in England. Going to Spain, he urged on the attempted invasion of Philip II, which resulted in the disaster of 1588. He also labored at the Catholic courts of Europe to save Mary, Queen of Scots. A skillful organizer, he founded schools for English Roman Catholics at Eu in Normandy (1584), at Saint-Omer (1592), and at several places in Spain. Appointed rector of the English College in Rome in 1597, he exerted immense influence. Parsons died in Rome, April 15, 1610. He wrote a clear and vigorous English style, which was commended by Swift and Gibbon. Consult Foley, *Records of the English Province of the Society of Jesus* (5 vols., London, 1877-79).

PARSONS, SAMUEL HOLDEN (1737-89). An American soldier and judge, born at Lyme, Conn. He graduated at Harvard in 1756, studied law at Lyme, Conn., with Gov. Matthew Griswold (his uncle), began practice in 1759, and was for 18 years a member of the Connecticut Assembly. In 1774 he removed to New London and became a member of the Connecticut Committee of Correspondence. At the outbreak of the Revolutionary War he took command of the Sixth Connecticut Regiment, was present at the siege of Boston and at the battle of Long Island, and planned the attack on Ticonderoga, being promoted for his services to the rank of brigadier general in August, 1776, and of major general in 1780. At the close of the war he practiced law at Middletown, Conn. In 1785 he was a member of a commission appointed to treat with the Miami Indians, in 1788 he sat in the convention which ratified for Connecticut the Federal Constitution, and in 1789 he became, on Washington's appointment, the first judge of the Northwest Territory. He settled near Marietta, Ohio, and soon afterward, on behalf of Connecticut, bought from the Indians about Lake Erie their claim to the Western Reserve. He was drowned in the Big Beaver River while returning from this expedition. Within recent years letters have been discovered which seem to convict Parsons of treason in supplying the British with information during the Revolutionary War. Parsons published a paper on the "Antiquities of the Western States," in vol. 11 of the *Transactions of the American Academy of Arts and Sciences*. Consult G. B. Loring, *A Vindication of General Parsons* (Salem, Mass., 1888), and C. S. Hall, *Life and Letters of Samuel Holden Parsons* (Binghamton, 1905).

PARSONS, THEOPHILUS (1750-1813). An American jurist. He was born at Byfield, Mass., Feb. 24, 1750, and graduated at Harvard in 1769. From 1770 to 1773 he taught school at

Falmouth, now Portland, Me., at the same time studying law, and was admitted to the bar in 1774. He began the practice of his profession at Falmouth, which was laid waste by a British squadron in October, 1775; and Parsons, whose prospects for professional success at Falmouth were ruined by this disaster, returned soon afterward to Byfield, his native town. There for some years he studied under Judge Edmund Trowbridge of the Massachusetts Superior Court. Parsons finally removed to Newburyport, where he soon acquired an extensive practice. In 1778 he was active in the discussion of the new constitution of Massachusetts, then recently framed by the Legislature. Parsons was strongly opposed to the adoption of that instrument; he was a member of the Essex Junto, which comprised a large number of the citizens hostile to the new constitution; and the pamphlet called *The Essex Result*, which had a great influence in bringing about the defeat of the constitution, is attributed to him. In 1779 he sat in the convention which drew up the constitution which with some changes still exists as the fundamental law of Massachusetts. In 1788 he was a member of the State convention called to ratify the Federal Constitution, which he warmly supported, and the so-called *Proposition* in favor of its adoption, though offered by John Hancock, was drawn up by Parsons. He settled in Boston in 1800. From 1806 until his death he was Chief Justice of the State Supreme Court. A memoir (Boston, 1859) was prepared by his son, Theophilus. Consult his *Commentaries on the Law of the United States* (Boston, 1836); S. L. Knapp, in *Biographical Sketches of Eminent Lawyers*, vol. i (ib., 1821); E. F. Stone, *Parsons and the Constitutional Convention* (Salem, 1899).

PARSONS, THEOPHILUS (1797-1882). An American jurist and legal author, born at Newburyport, Mass., in 1797. He graduated at Harvard in 1815, was admitted to the bar, and began to practice in Taunton. Soon afterward he removed to Boston, where he became the founder and editor of the *United States Literary Gazette*. He was also a frequent contributor to the *North American Review*. In 1847 he was appointed Dane professor of law in the law school of Harvard University, an office which he filled with distinction for a quarter of a century. His works are characterized by accuracy and practical usefulness to the profession rather than by profundity of knowledge or great legal acumen. They were consequently very successful in winning the favor of the profession and through successive revisions retained their position as useful legal handbooks for half a century. His best-known works are: *Treatise on the Law of Contracts* (1853; 9th ed., 1904); *Elements of Mercantile Law* (1856); *Law of Partnership* (1867; 4th ed., 1893); *Marine Insurance Average* (1868). Parsons was a Swedenborgian, and he produced a number of works maintaining the doctrines of the New Jerusalem church. The most important are: *Essays*, in three series; *Deus Homo* (1867); *The Infinite and the Finite* (1872).

PARSONS, THOMAS WILLIAM (1819-92). An American poet and translator of Dante, born and educated in Boston. In 1836 he went to Italy, where his studies in the literature of that country resulted in his well-known translation of the first 10 cantos of Dante's *Inferno* (1843). This part of the *Divina Commedia* he completed

in 1867. He translated much of the *Purgatorio* and a few fragments of the *Paradiso*, but he never completed the work. He later took up dentistry as a profession and practiced in Boston and in London. The last 20 years of his life were spent in or near Boston. Parsons owes his fame almost wholly to his rendering of Dante. Most of this translation is in rhymed couplets. Aside from his Dante translations, his work includes: *Ghetto di Roma* (1854); *The Magnolia, and Other Poems* (1867); *The Old House at Sudbury* (1870); *The Shadow of the Obelisk, and Other Poems* (1872). He is the Poet of Longfellow's *Tales of a Wayside Inn*. Parsons died in Scituate, Mass., Sept. 3, 1892. His poems appeared in a definitive edition in 1893.

PARSONS, USHER (1788-1868). An American surgeon, born at Alfred, Me. He studied medicine under Dr. John Warren in Boston and entered the navy in 1812. As acting surgeon he was in sole charge of the wounded on the flagship *Lawrence* at the battle of Lake Erie in consequence of the illness of the two other surgeons. For his conduct at that time he was promoted to full surgeon. After eight years of duty he resigned and settled in Providence, R. I. He was professor of anatomy at Dartmouth in 1820-22 and at Brown from 1823 to 1828, and president of the Rhode Island Medical Society from 1837 to 1839. Among his writings are: *Sailor's Physician* (1824; 4th ed., 1851, as *Physician for Ships*); *Directions for Making Anatomical Preparations* (1831); *Battle of Lake Erie* (1852); *Brief Sketches of Officers who Were in the Battle of Lake Erie* (1862).

PARSONS, WILLIAM. See ROSSE, 3d EARL OF.

PARSONS, WILLIAM BARCLAY (1859-). An American civil engineer, born in New York City. He graduated A.B. in 1879 and C.E. in 1882 from Columbia University and then established himself in general practice in New York. Parsons also served as chief engineer of the Rapid Transit Commission of New York from 1894 to 1905 and as a member of the Isthmian Canal Commission (1904) and of the board of consulting engineers of the Panama Canal (1905). He wrote: *Track* (1885); *Turnouts* (1885); *An American Engineer in China* (1900).

PARSONS' CAUSE. The name of a celebrated case decided by the court of Hanover Co., Va., in December, 1759, remembered chiefly because of a speech made before the court by Patrick Henry (q.v.). From the earliest history of the Colony the salaries of the clergy in Virginia had been paid in the form of tobacco, long the Colony's chief staple. Owing to fluctuations in the value of tobacco, the actual amount thus paid had varied widely, the clergy receiving the advantage of a rise in price and correspondingly suffering the disadvantages of a fall. In 1748 the Legislature of Virginia passed an Act fixing the salary of the clergy at some 17,000 pounds of tobacco, and George II formally approved the Act. In 1758, when the price of tobacco was unusually high on account of a probable failure of the crop throughout the province, the Legislature passed an Act, to be in force for 12 months, similar to a previous Act of 1755, which had lapsed and which had provided that the salary of the clergy might be paid in paper currency instead of tobacco, at the rate of twopence per pound, a price below the market value of tobacco at that time. The

operation of the Act was limited to one year. The ministers, whose entire income was derived from tobacco, suffered more severely than any other class in the community. Upon the protest of the clergy the Act of 1758 was disallowed by the King, and various clergymen forthwith brought suit against their vestries for the salaries legally due them for the year 1758. One such suit was brought by the Rev. James Maury before the court of Hanover County, of which Patrick Henry's father was the presiding judge, and Patrick Henry, then a young, almost unknown lawyer, was engaged by the defendants as counsel. The court decided against the validity of the Act of 1758, such Act having been disallowed by the crown, but the jury, influenced by an impassioned speech by Henry, returned a verdict of only one penny damages. The speech made by Henry was the first in which he attracted general attention and was sufficiently radical to be considered incendiary and treasonable by the conservative element in the Colony. According to the report of Maury, Henry argued that, since the Act of 1758 was an Act of general utility, it could not be annulled by the King, and asserted that "a king by disallowing acts of this salutary nature, from being the father of his people, degenerates into a tyrant and forfeits all rights to his subjects' obedience." Consult M. C. Tyler, *Patrick Henry* (Boston, 1887), in the "American Statesmen Series."

PARSON'S TALE, THE. The last of Chaucer's *Canterbury Tales* and, like "Melibæus," written in prose. It is a discourse on penitence, from the Vulgate text of Jer. vi. 16, and is mainly an adaptation from Frère Lorens, *La somme des vices et des vertus*, published in 1279, through the English translation entitled *The Avenbite of Inweyt* (Remorse of Conscience). It contains many quotations from the Latin

Ireland, on the Little Brosna, 43 miles north-east of Limerick (Map: Ireland, D 5). It is an important corn market, a considerable centre of inland commerce, a military station, and the seat of a union workhouse, and is one of the handsomest and best-built towns in Ireland. It has several fine churches and chapels, a nunnery, a statue of the Duke of Cumberland, a bronze statue of the Earl of Rosse, a town hall, a library, literary institute, a model school, and other educational institutions. The principal attractions are Birr Castle, the seat of the Earl of Rosse (q.v.), with its observatory, containing a great telescope, 52 feet long, and the laboratory, still maintained in active use by the present Earl. The town manufactures whisky, ale, leather, and flour. Birr had its origin in a monastery founded by St. Brendan in 573 and was the scene of many important events, both in the Irish and in the postinvasion periods. Pop., 1901, 4438; 1911, 4047.

PART (OF, Fr. *part*, from Lat. *pars*, part; connected with Lat. *parare*, to prepare, Gk. *ετορον*, *eporon*, I prepared). In music, when a piece of music consists of several series of sounds performed simultaneously, each series is called a part. In a composition a distinction is made between *real parts* and *auxiliary parts*. Real parts are those that progress through an entire composition as so many individual voices. A vocal fugue may be written for three, four, or five voices. It has therefore three, four, or five real parts, even if one or more voices rest for a number of bars. Auxiliary parts are in reality but detached tones serving to mark a strong accent by doubling some or all tones contained in the real parts. It is evident that in vocal music no auxiliary parts can occur. But in writing for keyed instruments or full orchestra composers make frequent use of such

The image displays a musical score for a piece titled "Parson's Tale". It consists of six staves, each representing a different instrument or voice part. The staves are labeled as follows: Flutes (Sva.), Oboes, Clarionets in A, Bassoons, Horns in A, and Violins. The notation is in a common time signature (C) and features various musical symbols such as notes, rests, and beams. The Flutes and Oboes parts show more complex melodic lines, while the Clarionets, Bassoons, and Horns parts are more rhythmic and harmonic. The Violins part is also melodic and includes some double bar lines. The overall arrangement suggests a full orchestral or chamber music setting.

fathers and was probably once a separate treatise written before 1380.

PAR/SONSTOWN, or BIRR. A market town and urban district in King's County,

auxiliary tones. In a composition for piano-forte, e.g., let us say four real parts are used. In certain places the composer desires more sonority, and there he writes six or even more

tones to be struck simultaneously. Any number above four tones constitutes the auxiliary part, for such voices are added only occasionally. Care must be taken not to introduce auxiliary parts too closely together, as the ear is apt to conceive them as real parts and consequently to demand adherence to the strict rules of progression exacted in the real parts. A splendid example of the use of auxiliary parts is furnished by the opening bars of Beethoven's A Major Symphony, where the strings are used in auxiliary parts to give a strong accent to the first beat of the 1, 3, 5, and 7 measures, while the real parts are given to the wood wind.

In this example the oboes have a real part throughout, the clarinets enter with a real part in the third bar, the flutes in the sixth, the horns in the fifth, the bassoons in the seventh bar. The violins throughout have only additional parts or notes. The detached notes of the other instruments before their participation in the real parts are also considered additional parts. See MUSICAL SCORE, p. 119.

PARTANNA, păr-tân'nà. A town in the Province of Trapani, Sicily, 38 miles southwest of Palermo (Map: Italy, D 6). It is on a hill which commands an extensive view. The remains of Greek works of art and ruins of several Saracenic castles are found here. There is a trade in grain, wine, and oil. Pop. (commune), 1901, 14,059; 1911, 14,122.

PARTANT POUR LA SYRIE, păr-tân' pōōr là sè'rè' (Fr., departing for Syria). A ballad by Count de Laborde (1809). A young warrior, Dunois, by his bravery in Syria, wins a battle and gains the daughter of his lord. Queen Hortense composed music for the ballad, which became extremely popular long after her death, during the Second Empire.

PART BOOK. In music, a book containing an entire part of a composition for a single performer. Before the seventeenth century scores were practically unknown. The individual voices or parts of a polyphonic composition were printed in separate books, just as are the separate parts of an orchestral composition used by the members of a modern orchestra. In order to simplify the interpretation of the music part books were also so arranged that all the parts were printed in a single book, but not in score. The soprano and alto appeared on the left-hand page, while the tenor and bass were printed on the right-hand page.

Soprano	Tenor
Alto	Bass

The music was so arranged that all parts turned at the same time. Jacques Moderne in 1539 printed a part book in such a manner that the four singers could sit opposite, facing each other in pairs.

Tenor	Soprano
Alto	Bass

This was a decided improvement. Such part books containing all the parts were printed in very large type for the convenience of the performers, whereas the single part books were generally printed in very small type.

PARTHENIUS (Lat., from Gk. Παρθένιος). A Greek grammarian and poet, a native of Nicæa in Bithynia, who lived at Rome in the first century B.C. He taught Vergil Greek and was an intimate friend of the elegiac poet Cor-

nelius Gallus, to whom he dedicated his *Erotic Experiences* (Περὶ Ἐρωτικῶν Παθημάτων), the only work of his which has survived. This was a collection of 36 brief stories of unhappy lovers, compiled from ancient poets, and was intended to furnish Gallus with themes for his epic and elegiac poems. The work contains interesting quotations from the Alexandrine poets and is valued as a precursor of the Greek novels. It has been edited by Westermann in his *Mυθολογία* (Brunswick, 1843), by Hirschig, in the *Scriptores Erotici Græci* (Paris, 1856), and by P. Sokolowski and E. Martini, in *Mythographi Græci*, vol. ii (Leipzig, 1896, 1902). According to the Ambrosian manuscript of Vergil, the latter's poem *Moretum* was an imitation of Parthenius' Greek work of the same title. Consult Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (5th ed., Munich, 1911).

PARTHENOGENESIS (Neo-Lat., from Gk. παρθένος, *parthenos*, virgin + γένεσις, *genesis*, production, from γίγνεσθαι, *gignesthai*, to become). The essential phenomenon of sexual generation is the union of a male with a female cell. Within the past half century, however, comparatively numerous cases have been discovered where unfertilized eggs have developed into an adult organism. Such cases in certain animals are known to be in a degree regular, normal methods, and the phenomenon is called agamous, virgin reproduction, or "parthenogenesis," the name proposed by R. Owen. The most typical case of parthenogenesis is that of the *Aphis*, or plant louse. The species is represented in the aphides by eggs alone. (See HOP INSECTS.) In the spring females alone hatch, and no males appear until at the close of summer. Bonnet discovered that a virgin *Aphis* may become the parent of millions of aphids, like itself, there being nine generations through the summer. Duval obtained 11 generations in seven months, while Kyber even observed that a colony of *Aphis dianthi*, which had been brought into a constantly heated room, continued to propagate for four years in this manner without the intervention of males. At the approach of cold weather males appear; they mate with the females, the latter laying eggs. There are thus two sets of females, the parthenogenetic and the normal oviparous forms. The queen bee also lays eggs in the drone or male cells of the honeycomb, which are unfertilized and give rise to males.

Cases of parthenogenesis are known to occur rarely in other Hemiptera than aphids, viz., in bark lice and in the silkworm and 25 or more other species of moths. Among Hymenoptera, besides the honeybee and some wild bees (as *Halictus*), the currant worm (*Nematus ventricosus*) and 12 other species of sawflies have been known to lay parthenogenetic eggs; also many gallflies; in several species of ants and in wasps (*Polistes*) the parthenogenetic eggs produce males. Among beetles *Gastrophysa raphani* and a species of caddis fly are at times parthenogenous; also certain mites and other insects, and in the crustaceans *Apus*, *Artemia*, and *Limnadia*.

It was formerly supposed that these parthenogenetic eggs were different from normal eggs, and they were called "pseudova" by Huxley, but this view is untenable, since these pseudova arise just like ordinary eggs and develop like them, as they undergo cleavage of the yolk

and form germ layers. R. Hertwig claims that parthenogenesis is "a sexual reproduction in which a degeneration of fertilization has taken place, and the facts of parthenogenesis show that under change of conditions the normal mode of sexual reproduction (amphigony) may be modified for the benefit of the species."

Pædogenesis. The larva or maggot of a certain gall-gnat fly is known to produce young which is developed within the body of the larva from a "germ ball" essentially agreeing with an ovary in appearance. The asexual larvæ begin life as egglike bodies developed from the germ ball, just as eggs are developed in the little tubes of which the ovary is an aggregation. Both Wagner and Leuckart conclude that the processes of embryonic growth agree in all essential points with the ordinary phenomena of



PARTHENOGENESIS.

Larva of a gall gnât (Cecidomyidæ) with pædogenetic daughter larvae.

development in a fecundated egg and exactly as in the case of *Aphis* parthenogenesis. The only difference consists in the germ chambers of the cecidomyid larvæ separating from the germ stock and moving freely about in the cavity of the body, while in the aphids, in which there is no metamorphosis, the germ stock is a true ovary. It thus appears that the free ovary or germ mass of the parent maggot becomes prematurely developed, and the growth of young is thus greatly accelerated. The maggots live under the bark of the apple tree in Germany, Denmark, and Russia, the phenomena occurring in two species of Cecidomyidæ (*Maastor metroloas* and *Oligarces paradoxus*). Here also belongs the case of larval reproduction in *Amblystoma*.

Chrysallogenesis. This term is applied by Packard to a form of pædogenesis which occurs in the chrysalis of a gnât of the genus *Chironomus*. In 1869 Grimm discovered the pupa of a species of this gnât laying eggs. In autumn other pupæ changed to flies without laying eggs, while the fly was observed to deposit a larger number of eggs than the spring pupa. It is thus seen to be a seasonal phenomenon, dependent on the temperature. Grimm also found that, on removing from the perfectly developed insect before it has left the pupa case the eggs which otherwise would have been fertilized, and nurturing them in water, the development of the larvæ took place in them also, but lasted a little longer (about six days).

Metagenesis. This term was proposed by Owen in 1848 in his *Parthenogenesis* and afterward more fully in his *Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals* (London, 1858). His examples are the alternation of generations of the distomes, the hydroids, medusæ, and even the metamorphoses of the echinoderms, the gemmation of *Nais* and other annelids, as well as the metamorphoses of the fish lice (*Atheres*, etc.), which he says "is a slightly modified parthenogenesis"; again, he regards the phases they pass through as "much more those of a metagenesis than a metamorphosis." (See ALTERNATION OF GENERATIONS.) In his paper on the agamic

reproduction of *Aphis* Huxley employs the term "agamogenesis," which he says occurs "when the produced 'zoëid' is capable of development into an independent organism without the influence of an act of conjugation with another zoëid. The producing zoëid may be devoid of sexual organs, as in the Salpæ, many Hydrozoa, and many Trematoda," in fact in the great majority of cases of agamogenesis; and to this kind of alternation of generations he applies Owen's term "metagenesis," restricting the term "parthenogenesis" to cases where the parent "protozoëid" possesses sexual organs (ovaries), and its buds have all the histological characters of ova. Metagenesis is defined by R. Hertwig as "alternation of generations in the narrower sense." It is the alternation of at least two generations, of which one reproduces only asexually, by division or budding, the other either exclusively or at least to a great extent sexually. The first generation is called the "nurse"; the second, the "sexual animal." The best example is furnished by the mode of reproduction of Hydromedusæ. See HYDROZOA.

Heterogony. This differs from metagenesis by the fact that the asexual generation is replaced by parthenogenesis. For example, in certain Crustacea (Daphnidæ) only females occur in the summer time, which increase by unfertilized eggs. Then males appear for a short time, which fertilize the winter eggs which are now produced, from which again parthenogenetic generations arise (R. Hertwig).

Causes of Asexual Reproduction. Taking all these cases together, asexual reproduction of parthenogenesis in general is seen to be due to budding or cell division in the egg. The asexual aphids bud out from the ovary. It was for a long time held, says Hertwig, that the cells from which the cercariæ arose were not eggs, but "internal buds," "germinal granules." The fact seems to be that normal reproduction with growth and parthenogenesis are but extremes of a single series. The asexual mode of reproduction is most probably due to temperature and other changes in the conditions of life, as change of food and, in parasitic animals, change of host (Packard). The phenomenon takes place in the summer and in almost every case ceases at the approach of cold weather.

The case of dimorphism of a threadworm has been incorrectly regarded as heterogony, but it is simply due to changes of temperature. Thus, in low temperature filaria forms directly arise from the young of *Rhabdonema* (*Anguillula*) *intestinalis*; but in the summer heat indirectly forms a *Rhabditis* form. Wasman was able during three summers to induce parthenogenesis in the workers of *Formica sanguinea* and their slaves (*Formica pisca*) by artificially warming the nests. Abundant food favors parthenogenesis, though in *Phyllopera* the stoppage of the food supply induces parthenogenesis. See *Effects of Changes of Temperature under EVOLUTION*.

Artificial Parthenogenesis. Experiments by Herbst, R. Hertwig, T. H. Morgan, and especially by Loeb show that the unfertilized eggs of the sea urchin may be so stimulated by chemical solutions as to undergo the earlier phases of development. Herbst experimented with potassium chloride and lithium chloride, but found that while the larvæ developed they were monstrous and finally perished. Hertwig and also Morgan showed that if unfertilized eggs

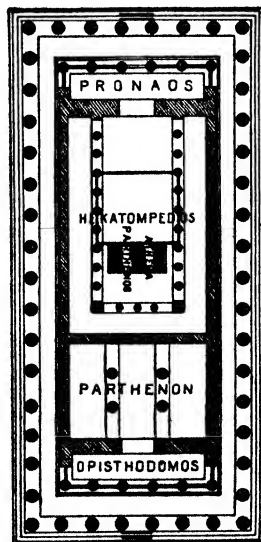
be treated by weak solutions of sodium chloride, magnesium chloride, or strychnine, they exhibit some of the preparatory changes of yolk division and might actually divide, though without producing an embryo. Loeb finally succeeded in rearing large numbers of perfect larvæ from eggs which without fertilizing are first treated with a weak solution of magnesium chloride and then transferred to normal sea water. It thus appears that experiments carried out under rigidly controlled conditions show that the egg, without union with a sperm cell, is capable of complete development. In commenting on these discoveries E. B. Wilson (*International Monthly*, July, 1900) remarks that even in normal fertilization we must regard the stimulus to development as being given by a specific substance or substances carried by the spermatozoön. The experiments lead us to suppose that the chemical salts used "are individually poisonous to the egg, but are normally so balanced as to neutralize one another's injurious effects and maintain the equilibrium of the egg. If this armed neutrality be disturbed, the egg responds, undergoing degenerative changes and dying if the change be too violent, passing through an abnormal development and giving rise to monstrous embryos if the new conditions be less favorable, but under appropriate stimulus being, as it were, released from bondage and rendered free to run its normal course of development."

In Plants. Parthenogenesis has been observed at all levels in the plant kingdom, and the term is usually restricted to the production of a new individual by an unfertilized egg. One of the long-known cases among fungi is that of the water molds (*Saprolegnia*, q.v.), among which parthenogenesis is frequent and perhaps usual. All stages of abortion of the male apparatus have been observed, as, e.g., the fertilizing tube reaching the egg, but remaining closed; the tube reaching the wall of the oögonium, but not reaching the egg; the suppression of the fertilizing tube; or even the suppression of the antheridium. In all these cases the eggs behave as if fertilized and produce new plants. The ferns are notably parthenogenetic, the gametophyte (q.v.) under appropriate conditions not only producing sporophytes (q.v.) freely by vegetative apogamy, but also by parthenogenesis. Parthenogenesis has also been observed in several genera of angiosperms, the earliest recorded being *Antennaria*, *Alochemilla*, and *Thalictrum*. To these have been added *Taraxacum*, *Hieracium*, *Gnaphalium*, etc. It is a noteworthy fact that the majority of these genera belong to Compositæ, the ranking family of angiosperms. In most of these angiosperms the cytological situation has been investigated, and it has been discovered that parthenogenesis is associated with a failure of the reduction division, resulting in a diploid egg. Certain observations indicate also that these diploid eggs of angiosperms are incapable of fertilization. This raises the question whether the term "parthenogenesis" should not be restricted to the production of a new individual by a haploid egg, i.e., a normal egg, capable of fertilization. Among the ferns such eggs have been observed to produce new individuals, resulting in sporophytes with the half (haploid) number of chromosomes.

Bibliography. Saks, "Zur Entwicklungsgeschichte der Mollusken und Zoophyten," in

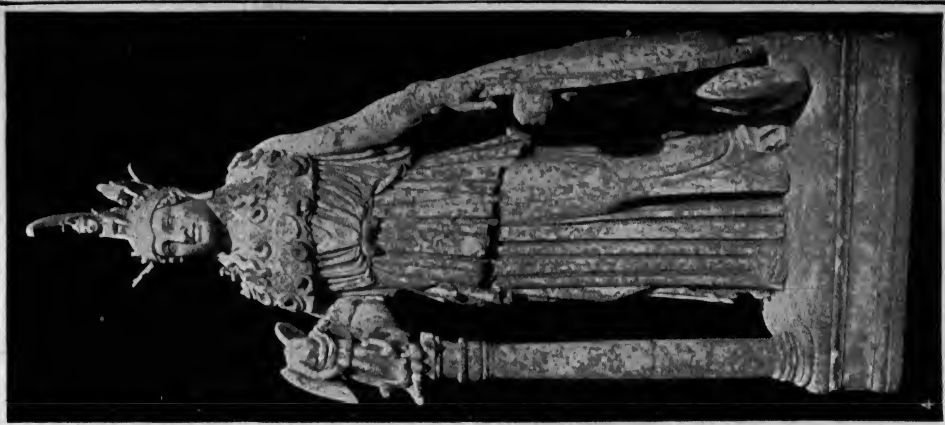
Wiegmann, *Archiv für Naturgeschichte*, vol. i (Berlin, 1837); J. J. S. Steenstrup, "On the Alternation of Generations," in *Transactions of the Royal Society* (London, 1845); Sir Richard Owen, *On Parthenogenesis* (ib., 1849); id., *Lectures on the Comparative Anatomy and Physiology of Invertebrate Animals* (2d ed., ib., 1855); K. T. E. von Siebold, "On a True Parthenogenesis in Moths and Bees," in *Transactions of the Royal Society* (ib., 1857); T. H. Huxley, "On the Agamic Reproduction and Morphology of Aphids," in *Transactions of the Linnean Society of London*, vol. xxii (ib., 1858); H. G. Leuckart, "Sur l'arrhénotokie et la parthénogénèse des abeilles et des autres hyménoptères qui vivent en société," in *Bulletin de l'Académie des Sciences de Bruxelles*, vol. iii (2d series, Brussels, 1857); Siebold, *Zur Kenntnis des Generationswechsels und der Parthenogenesis bei den Insekten* (Frankfort, 1858); Von Baer, *Ueber Prof. Nic. Wagners Entdeckung von Larven, die sich fortpflanzen, Herrn Gans verwandte und ergänzende Beobachtungen und über die Padogenesis überhaupt* (St. Petersburg, 1865); Taschenberg, *Historische Entwicklung der Lehre von der Parthenogenesis* (Halle, 1893), containing a full bibliography up to and including 1892; Jacques Loeb, "Experimental Study of the Influence of Environment on Animals," in *Darwin and Modern Science* (Cambridge, 1909); id., *Artificial Parthenogenesis and Fertilisation* (London, 1914).

PARTHENON (Lat., from Gk. Παρθενών, from παρθένος, *parthenos*, virgin). A celebrated temple of the virgin goddess Athena, on the Acropolis of Athens. The highest triumph of Greek Doric architecture, it was the work of the architect Ictinus (q.v.), while the sculptures are generally believed to have been designed by Phidias (q.v.). The building was a Doric octostyle peripteros with 17 columns on the long sides. It was 100 by 225 Attic feet (about 101 by 228 English feet); from the top of the stylobate to the gable the height was about 59 feet. Behind the outer row of eight columns, at either end of the temple, are six columns, forming the fronts of the *pronaos* and the *opisthodomos*. The main hall of the temple called the *naos* or *hekatompēdos*, was 100 Attic feet in length and contained the great gold and ivory statue of Athena by Phidias. It was divided by two rows of columns into a central space and two narrow side aisles. These colonnades were each in two stories of superposed Doric columns and helped to support the wooden roof. Back of this was another room, entered from the *opisthodomos* only, and called the *parthenon*. In the building the most deli-



PLAN OF PARTHENON.

PARTHENON



1. METOPE—Centaur and Lapith, British Museum, London.
2. FRIEZE—Athenian Cavalry, British Museum.

3. EAST PEDIMENT—The Three Fates (so called), British Museum.
4. THE VARVAKEION STATUETTE, a copy of the Athena Parthenos, National Museum, Athens.

cate refinements were introduced in order to correct optical distortions. The lines of the stylobate, cornice, and columns were delicately curved, though with such nicety that often the curvature can be detected only by the most careful sighting or measurement. That these refinements were carefully calculated from the start is shown by the cutting of the rock on which the crepidoma rests to allow of the proper curvature in the lines of the stylobate. These interesting facts were first observed in 1814 by Allason, and later by Cockerell and Pennethorne (q.v.), published to the world in 1838 by Hoffer, and after careful reinvestigation elaborated by F. C. Penrose, in his *Principles of Athenian Architecture* (London, new ed., 1888). (See REFINEMENTS OF ARCHITECTURE.) The whole building was of carefully selected white Pentelic marble, with the exception of the tiles of the roof, for which Parian marble was employed. (See Colored Plate under ARCHITECTURE. For a brief discussion of the question of the internal lighting of the naos and statue, see TEMPLE.) Begun about 447 B.C., the temple was sufficiently completed to permit the installation of the statue in 438 B.C. It continued in use till the end of the fifth or possibly the sixth century of our era, when it was transformed into a Christian church, dedicated at first to the Divine Wisdom and later to the Virgin. After the capture of Athens by the Turks (1458 A.D.), it became a mosque, and a minaret was built in the southwest corner. It was, however, but little damaged, and in 1674 the sculptures were drawn by Jacques Carrey and other artists in the suite of the Marquis de Nointel. In 1687, during the siege of Athens by the Venetians, the Turks used it as a powder magazine, and on September 26 a Venetian bomb fell through the roof, causing an explosion which killed 300 persons and completely destroyed the central portion of the building. Early in the nineteenth century Lord Elgin secured permission to remove the sculptures to London. (See ELGIN MARBLES.) Apart from its value in the history of architecture, the Parthenon is of the greatest importance for the history of Greek sculpture. The two pediments were filled with colossal sculptures in the round, those in the east representing the birth of Athena from the head of Zeus and those in the west the contest of Athena and Poseidon over Attica. The 92 metopes, all of which were sculptured, represented, at the east end, the struggle between the gods and the giants and, at the west end, that between the Athenians and Amazons. On the south side was the battle between the Centaurs and the Lapithæ and on the north the capture of Troy and the victory over the Persians. But the great glory of the temple was the long frieze which ran entirely around the outer wall of the cella and over the columns at either end, wrought in low relief in the most perfect style of the noble art of the fifth century. It represented the great Panathenaic procession, in which all classes of Athenians assembled to do honor to the goddess. (See PANATHENÆA.) The effect of the sculptures and architecture was enhanced by the use of color and metal to bring out the details. The metopes show marked stylistic differences, both in design and execution, and cannot all be attributed to the mind of a single artist, nor can it be supposed that the other sculptures were the work of a single hand, though they seem to most critics to

show the influence of one master mind. They are characterized by a severe simplicity, scorning anything that savors of sensationalism or prettiness, but full of life and vigor in the animation of the frieze, of calm dignity in the figures of the gods, and everywhere marked by harmony and beauty in the lines and almost perfect technical skill in the treatment of the material.

Bibliography. Stuart and Revett, *The Antiquities of Athens* (London, 1762-1815); the unfinished work of Laborde, *Le Parthénon* (Paris, 1848), containing Carrey's drawings; Adolf Michaelis, *Der Parthenon* (Leipzig, 1871), the standard work; F. C. Penrose, *Principles of Athenian Architecture* (2d ed., London, 1888); Magne, *Le Parthénon* (Paris, 1895); E. A. Gardner, *Ancient Athens* (New York, 1902); A. S. Murray, *The Sculptures of the Parthenon* (ib., 1903); M. L. D'Ooge, *The Acropolis of Athens* (ib., 1908); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); C. H. Weller, *Athens and its Monuments* (New York, 1913); also references to Greek sculpture cited under GREEK ART. See ATHENS; PROPYLÆA; and Colored Plate of ARCHITECTURE.

PARTHENOPE, pār-thén'ô-pé (Lat., from Gk. Παρθενώμη). 1. The daughter of Stymphalus, beloved by Hercules. 2. A siren who drowned herself for love of Ulysses. She was cast up by the sea at Naples, which was named for her.

PAR'THENOPE'AN REPUBLIC (from *Parthenope*, the ancient name of the city of Naples). The name given to the state into which the Kingdom of Naples was transformed by the French Republicans, Jan. 23, 1799. It lasted only until the following June, when the invading army was forced to retreat.

PAR'THIA (Lat., from Gk. Παρθία, *Parthia*, from Παρθῆναι, *Parthênai*, Παρθῆναι, *Parthênai*, Παρθοί, *Parthoi*, Parthians). An ancient empire founded out of part of the old Persian Empire, lying to the southeast of the Caspian Sea (Map: Rome, G 3). The original inhabitants were probably of Turanian stock, related to the great tribes of Central Asia, whence have come the Huns, Mongols, Turks, and Magyars. The Parthians were distinguished by primitive simplicity of life and extreme bravery, though at the same time they were much given to bacchanalian and voluptuous pleasures. They neglected agriculture and commerce, devoting their whole time to predatory expeditions and warfare. They fought on horseback and after a peculiar fashion. Being armed solely with bows and arrows, they were rendered defenseless after the first discharge and, to gain time for adjusting a second arrow to the bow, turned their horses and retired, as if in full flight, but an enemy incautiously pursuing was immediately assailed by a second flight of arrows; a second pretended flight followed, and the conflict was thus carried on till the Parthians gained the victory or exhausted their quivers. They generally discharged their arrows backward, holding the bow behind the shoulder, a mode of attack more dangerous to a pursuing enemy than to one in order of battle. They were conquered by Cyrus in the sixth century before Christ, and their country was organized into a satrapy under Darius. Parthia was included in the conquests of Alexander the Great and after his death formed a part of the Seleucid Syrian Kingdom until about 250 B.C., when the people revolted successfully under Arsaces, founder of the dynasty of the

Arsacidae (q.v.), who maintained a most tyrannical despotism. The capital of the Parthian monarchy was Hecatompylos (the city of the hundred gates). The dominion of Parthia rapidly extended to the Euphrates and the Indus, and Parthia became a most powerful and flourishing empire; Seleucia, Ctesiphon—the capital of the Persian emperors of the Sassanidae—and other celebrated cities date their rise from this period and soon eclipsed in size and splendor the ancient Hecatompylos. In spite of repeated attacks on the part of the Romans the Parthians maintained their independence (see CRASSUS, MARCUS; ANTONIUS, MARCUS [Mark Antony]; AUGUSTUS); and though Trajan in 115–117 A.D. seized certain portions of the country, the Romans were soon compelled to abandon them. In 165, however, the Romans took from Parthia considerable territory. The final struggle with Rome took place in 217, when a desperate drawn battle at Nisibis made both parties desirous of peace. The Parthian Kingdom was then weakened by dissension, and in 226, during the reign of Artabanus IV, the last of the Arsacidae, a revolt headed by Ardashir, son of Babegan, broke out in Persia, and the Parthian monarch, beaten in three engagements, lost his throne and life, the Persian dynasty of the Sassanidae (q.v.) taking the place of the Arsacidae. Some scions of the Parthian royal family continued for several centuries to rule over the mountainous district of Armenia, under the protection of the Romans, and made frequent descents upon Assyria and Babylonia; but their history is obscure and of little importance. Consult: George Rawlinson, *The Sixth Great Oriental Monarchy* (New York, 1873); Percy Gardner, *The Parthian Coinage* (London, 1877); A. von Gutschmid, *Geschichte Irans und seine Nachbarländer von Alexander dem Grossen bis zum Untergang der Arsaciden* (1888); George Rawlinson, *Parthia*, in "Story of the Nations Series" (New York, 1899); Warwick Wroth, *Catalogue of the Coins of Parthia in the British Museum* (London, 1903); Petrowicz, *Arsakidenmünzen* (Vienna, 1904).

PARTIAL TONES. See CLANG TINT; HARMONICS.

PAR/TICEPS CRIM'INIS (Lat., a partaker in a wrong). In law, one who shares in the guilt of a wrongful act, whether civil or criminal. In the law of civil liability such a person has no right of recovery against his partner in wrongdoing for any injury suffered by him through the latter's fault. The courts will refuse to lend their aid either to divide the spoil or to equalize the burdens of wrongdoing. A gambler cannot recover from a fellow gambler who has cheated him. A person who has given a bond or deed to compound a felony is not entitled to have the instrument canceled either on the ground of its illegal object or because it was obtained from him by duress. If one of two joint wrongdoers is mulcted in damages, he cannot have contribution from his fellow wrongdoer. The burden lies where it falls. In the criminal law a *particeps criminis* is punishable as an abettor (see ABET, ABETTOR) or an accessory (q.v.).

PARTICIPLE (Fr. *participe*, Lat. *participium*, participle, a sharing, from *particeps*, partaking, from *pars*, part + *capere*, to take). In grammar, a word partaking of the characteristics of a verb and an adjective. Like the verb, it governs nouns or pronouns, and, like the adjective, it agrees in gender, number, and case with

the noun or pronoun which it modifies. The double function of the participle is illustrated in such sentences as *μνήσμαι αὐτὸν τοῦτο ποιῆσαντα* (I remember him doing this); *Flaminius restitit agrum dividendi* (he resisted Flaminius dividing the territory). Participles are either active or passive and are of various tenses, as present, past (aorist), perfect, and future. In English the active participle coincides in form with the abstract verbal noun, as, *going*. The two forms must be sharply distinguished in speech, as, *he is building the house*, but, *forty and six years was this temple in building* (whence such colloquial and archaic forms as *a-building*). There are only two classes of participles in English, the present and the past or passive, thus, *making, made; loving, loved*. The line of demarcation between the participle and the adjective is often difficult to distinguish, as they merge into one another. See GRAMMAR, *Bibliography*.

PAR/TICK. A municipal and police burgh of Lanarkshire, Scotland, on the north bank of the river Clyde. It is a western suburb of Glasgow, has numerous shipbuilding yards, and 1500 feet of wharfage along the Kelvin River. It manufactures paper, flour, and machinery. Pop., 1901, 54,274; 1911, 66,849.

PARTICULAR BAPTISTS. See BAPTISTS.

PARTICULAR ESTATE. In the common law of real property, any estate in possession, less than a fee simple. Thus, if lands are given to J. D. for life or in fee tail, and, on J. D.'s death or the failure of issue to J. S., in fee simple, J. D. is said to be seised of a particular estate (Lat. *particula*, small part) and J. S. of the remainder. J. D. is the particular tenant, J. S. the remainderman. The particular tenant, being in possession, had the power, by making livery of seisin, to convey a greater estate than he himself had and thus to disseise his remainderman. This was known as a tortious (wrongful) conveyance. It has been rendered impossible by statute both in England and in this country, a conveyance by whatever method now having the effect of conveying only such estate as the grantor has to convey. See DISSEISIN; ESTATE; REAL PROPERTY.

PARTICULARS, BILL OF. In English and American law, a statement of the items constituting a claim or allegation set up in a declaration of complaint or in a set-off or counterclaim. A party to a suit against whom such a claim or allegation is made may demand a bill of particulars in any case where the cause of complaint alleged is too general or indefinite to enable him to make his defense. The object of the procedure is to enable parties to go to trial with an understanding of the case they have to meet and thus to save expense and to prevent them from being taken by surprise. Under the reformed procedure both in England and the United States a party entitled to particulars may demand a bill, or statement, from his opponent and, if the demand is not complied with, may obtain an order of the court directing that the bill be delivered.

A party is bound by his statement of particulars just as though it had been embodied in his original statement of claim, though the court may in its discretion permit it to be amended.

It is impossible to lay down a general rule as to the kinds of particulars that may properly be demanded. Generally, whenever a lump sum

is claimed to be due, as for professional or other services, the party against whom the claim is made may demand a statement of the items constituting the claim. In divorce suits for adultery or cruel and inhuman treatment bills of particulars specifying the acts of adultery or of cruelty alleged have been ordered. So in a complaint for damages resulting from negligence the defendant is entitled to a statement of the items of damage as well as of the acts of negligence on which the claim is based. See PLEADING.

PARTIES. In law, in a general sense, those who have personal connection with an affair or transaction, or who are united in interest in any act or thing, as parties to a contract or a deed; in a specific sense, litigants in a legal action or proceeding. In cases in equity all persons who have a material interest in the subject matter of the proceeding, whether legal or equitable, must be made parties, and persons whose interests are antagonistic cannot be joined as complainants. In an action at law there are generally two parties, or classes of parties—the plaintiff, or complainant, and the defendant—but variations occur, as in attachment cases, in actions in rem, etc. In general, any person not under legal disability of some kind, such as an alien enemy, an idiot, or an infant, may become a party plaintiff or may be made a party defendant. For such persons as are under legal disability of any kind the law appoints or allows others to act for them, either in their names or on their behalf. Consult: DICEY, *Treatise on the Rules for Selection of Parties, etc.* (Jersey City, 1886); BARBOUR, *Summary of the Law of Parties to Actions, etc.* (Albany, 1884); and the authorities referred to under PLEADING; EQUITY; LAW; ETC. See also ACTION; ALIEN; DEFENDANT; INFANT; INSANITY; PLAINTIFF.

PARTING. See CLEAVAGE OF CRYSTALS; ASSAYING; GOLD; REFINING OF METALS; SILVER.

PARTINGTON, MRS. A character similar to Mrs. Malaprop in her wrong use of words. Its origin was probably the person of that name described by Sydney Smith in a speech on the position of the House of Lords in reference to the Reform Bill, as attempting to keep back the Atlantic Ocean with her mop.

PARTINICO, pàrt'e-nē'kò. A town in the Province of Palermo, Sicily, 14 miles west-southwest of Palermo (Map: Italy, D 5). Corn and fruit are produced in the vicinity, and there are manufactures of wine, oil, linen, and woolen goods. Pop., 1901, 23,729; 1911, 21,656.

PARTITION (Lat. *partitio*, division, from *partiri*, to divide, from *pars*, part). A division of real property or of goods and chattels among persons who have an undivided common interest in them so that each becomes the sole owner of a definite part or portion of the property. Compulsory partition was first allowed in the early common law as to coparceners, who became common owners of real estate by inheritance, on the theory that, as they became such owners by operation of law and without their consent, they should be entitled to have the property divided among them. But as estates held in joint tenancy and tenancy in common were ordinarily created by the voluntary act of the parties or with their consent, the old rule was that the estates could be dissolved only by common consent. In the course of time, however, the common-law rules were changed by statute, and since the reign of Henry VIII all estates

held jointly or in common have been subjected to compulsory partition. The English law as modified by statute has been adopted as the common law of the United States.

Originally, compulsory partition was obtained by means of a writ of partition, issued from a court of law, but subsequently the courts of chancery assumed jurisdiction; and in most American States the action is now considered more in the nature of an equitable action because of the character of the relief obtained. Compulsory partition is now confined almost exclusively to real estate, as personal property, when left by a decedent, is sold and the proceeds distributed by the executors or administrators; and it is seldom held in common except by virtue of a partnership relation, in case of the dissolution of which the sale of the property, or an accounting, is resorted to as the most convenient method of adjusting the rights of the partners.

Where the common owners of property agree upon a partition, it is usually effected by exchanging deeds, each conveying and releasing to the other all his right, title, and interest in and to the portion which the grantee is to receive. It is held in some States that a parol partition followed by actual possession of the respective portions of the parties is valid, on the ground that a conveyance is not necessary under the Statute of Frauds, as each party owned every portion in common with the others, but this is a most doubtful and unsatisfactory method.

Where the parties do not all agree that there should be a partition, and upon the shares to which each should be entitled, one or more of them may commence an action for partition. All parties having any possible interest in the property who do not join as plaintiffs should be made parties defendant. In some cases where the owners in common are all friendly, it is agreed that partition shall be made by the court, and one or more will consent to be made parties defendant, in order to give the proceeding the form of a litigated action. A few States permit all the parties in interest to join in an ex parte application to the court for partition, i.e., to apply by a petition in the name of all, no one being made party defendant. In all such "friendly" suits the costs are apportioned among the parties according to their respective interests.

The respective proportions or interests of the various parties are first determined, and the court then decides upon the division which will be equitable and just to all. The courts generally favor a division of the property itself where that is possible from its nature and situation. In some cases the courts may make a division of real estate among the interested parties and order those who receive parcels of greater value than the others to make a certain compensation to the latter. This is sometimes called "owelty (equality) of partition." In the actual division and apportionment of lands values of the respective portions are considered as well as area, and where the action is brought in a court of equitable jurisdiction each party will be allotted the portion which seems best adapted to his interests. A partition sale is conducted on the same principles as any other judicial sale. See JOINT TENANCY; REAL PROPERTY; TENANCY IN COMMON. Consult the authorities referred to under EQUITY; REAL PROPERTY.

PART MUSIC, or PART SONG. A com-

position for at least three voices, generally without instrumental accompaniment. The voices may be equal (all male or all female) or mixed

PARTNERSHIP (ME. *partener*, *parcener*, OF. *parcener*, from ML. *partionarius*, having a portion, from Lat. *partitio*, division) An unincorporated association of two or more persons carrying on a lawful trade or business with a view to profit. The term was formerly employed in a looser sense to designate any association of adventurers in a common enterprise, and it is in popular speech sometimes still employed of persons associated in a corporation or as part owners. But in the legal sense neither of these forms of combined or associated action is a partnership. As the relation is a peculiar one, vesting extensive powers in the members thereof and imposing on them an extraordinary responsibility for one another's acts, it is important to distinguish the partnership from other forms of association.

Test of Partnership. Ordinarily this is not a difficult thing to do. First, we inquire whether the association is a voluntary one, for the law does not institute the relation of partners between persons against their will. Property may be left to children by a parent. This does not make them partners. Each has a right to say whether or not he will combine his interest with the interests of the others in carrying on a common business. It follows from this necessity of a binding agreement between the parties that they must possess legal capacity to contract and that the partnership agreement must be of such nature and form as to be legally enforceable. An infant is not bound by a partnership contract. Convicts, alien enemies, and, as a rule, corporations are prohibited from entering partnerships. At common law married women were incapable of binding themselves by contract and consequently could not become partners, though this disability has now generally been removed by statute in whole or in part. Even when the parties have contractual capacity, their partnership contract may be worthless, either because its object is against public policy or otherwise illegal or because its form does not comply with the Statute of Frauds. Courts have properly refused to enforce partnership agreements for highway robbery, for conducting gambling establishments or houses of ill fame, for cornering markets, and for creating illegal monopolies.

The second question to ask is whether the parties are carrying on a business in common. A landowner often lets his premises to a tenant to farm on shares. This arrangement does not make them partners. Owners in common of a building agree that one of them shall have the general management of it and provide funds for necessary repairs, so as to make it habitable by tenants, and to divide the rent. Such an agreement does not amount to a partnership. If, however, they agree to supply the building with furniture at their joint expense, and to let furnished rooms to various tenants, they may well be held to intend the carrying on of a business in common. While it is possible and even common for partnerships to exist for buying and selling real estate or for renting it, the courts usually require that the intent of joint owners to throw such property into a fund as partnership stock shall be distinctly manifested.

Still a third question to be answered before a decision as to the partnership character of an association can be reached is whether it was entered into with a view of profit. The earliest form of partnership known to English law was that of ordinary merchants. Its sole object was pecuniary gain. Hence the courts of England and of this country have had no hesitation in declaring that "societies and clubs, organized and maintained for the promotion of temperance, for the enforcement of particular laws, for musical culture among their members, for the propagation of political, social, or religious doctrines, or even for mutual protection or insurance, are not partnerships, even though they may have for one of their objects the accumulation of property to be owned and enjoyed in common."

Formerly the right to share in the profits of a business was thought to constitute one a partner, whether he was a coowner in the enterprise or not. This view has been discarded in England and in most American States. A person may share the profits, as a servant or agent, as a lender of money, or as the lessor of property, without becoming a partner. Sharing the profits of a business is *prima facie* evidence that one is a partner, but it is no longer deemed conclusive. It may be overcome by evidence that the sharers are not carrying on the business in common—that they are not its joint proprietors.

Classes of Partnership. Various classifications have been made by writers and judges. A general partnership is one organized for the conduct of a business in accordance with the general usages of trade. A particular partnership is confined to a single transaction or enterprise. Joint-stock companies are a form of general partnership at common law, in which the members are allowed to transfer their shares without dissolving the firm, and the control of which is vested in a few designated managers. All of these forms are again classified as ordinary partnerships, in contradistinction to limited partnerships.

The limited partnership was introduced into the United States about the middle of the last century from the law of France. It was much slower in gaining a foothold in England, although strenuous efforts were made to develop it there after it had proved successful in America. It was not till 1907 that it secured recognition in that country through the enactment by Parliament of the Limited Partnership Act (7 Edw VII, c 24). New York was the first of the United States to provide by legislation for limited partnerships. This example was promptly followed by Connecticut, and now nearly every State has a statute upon the subject. The distinctive characteristic of a limited partnership is the conjunction of at least one general partner, who is liable for all the debts of the firm, as every member of an ordinary partnership is, with one or more special partners, whose liability is limited to their contribution to the capital of the firm. In a few States limited partnership associations are authorized. These differ from the regular limited partnership in that their capital alone is responsible for their debts, none of the partners is subject to any personal liability. Both of these institutions, it will be observed, are creatures of statute. Accordingly, if the statutory provisions are not complied with, all the mem-

bers of the association are liable as general partners. The chief requirements are these: a certificate must be signed, acknowledged, registered, and published by the partners, stating the name under which the partnership is to be conducted, the general nature of the business to be done, the names and residences of the various members with a designation of the general and of the special partners respectively, the amount of capital contributed by the special partners, and the times at which the partnership is to begin and to end. An affidavit must also be made and filed with the certificate, stating that the sums specified in the certificate to have been contributed by the special partners have been actually and in good faith paid in cash. In some States the capital of the special partners may be contributed in property other than cash. See *SOCIÉTÉ EN COMMANDITE*.

In addition to the two kinds of partners designated by limited partnership legislation, the general partner and the special partner, we have three others, which must be briefly described. An active or ostensible partner is one who frankly avows his membership in the firm and actively and openly promotes its business. A dormant partner is one who conceals from the public his connection with the firm. In England and in a few of the United States he may take part in the conduct of firm affairs without losing his status, but the view prevailing generally in America is that he must take no part in the business—that both secrecy and inactivity are included in the term “dormant.” The third kind goes under various names. Sometimes he is called the nominal partner, at others the holding-out partner. Still again he is described as the quasi partner, or partner by estoppel. Each of these designations indicates that he is not a partner at all, but that he is nevertheless liable, as if he were a partner, to those persons who have acted upon his representations that he was a partner and who would suffer loss if he were permitted to repudiate the relation asserted by him.

Nature of Partnership. After a partnership has been formed the association is generally spoken of as a firm, and the name in which it does business is called the firm name. Unless forbidden by statute, the firm may adopt any name it pleases and may change it at will, or it may go without a name. Occasionally the Legislature prohibits the use of the words “and company” or “& Co.” unless such terms represent an actual partner, or it forbids the assumption of a corporate name. Even in the absence of a statute a partnership is not at liberty to choose a firm name which will operate as a fraud upon the public or upon others trading under substantially the same name.

The law merchant treats the firm as a legal entity—as a sort of artificial person much like a corporation. When the partners make their contribution to firm capital they cease to own it as individuals and title passes to the firm. The firm becomes their debtor for the capital. They lend money to the firm or borrow from it. The firm, in other words, has its own property, its own creditors, and its own debtors. This conception of the firm prevails very generally among the mercantile classes both in England and in the United States. It is always observed by partnership bookkeepers. To some extent it has been recognized by State and Federal statutes, permitting the firm to sue and be sued as

an association and to be declared a bankrupt. The entity theory of partnership, however, has never received full judicial sanction by English or American courts. And American judges, who in construing mercantile contracts have given effect as far as possible to the mercantile conception of partnership, have declared “that the firm is not recognized by lawyers as distinct from the members composing it.” It follows from this view that if lands are purchased by a firm, the deed should name the partners as grantees, and if the partnership sells lands, the deed should name the partners as grantors, and they and their wives should execute and acknowledge the conveyance precisely as though they were tenants in common of the property.

But this conception of a firm as a mere association of individuals is not applied consistently in any jurisdiction. For example, we have said that an infant, because of his contractual incapacity, is not bound by his agreement to become a partner nor by the partnership agreement with third persons. Yet, after he has entered a firm and taken part in its management, he is not allowed to withdraw his capital until firm debts are paid. That is, he may escape personal responsibility for partnership obligations, but the firm ownership of firm property prevents his taking away any money or goods which he had contributed to the firm. Again, a partner's share in the firm is not the interest of a tenant in common in specific articles. It is only a chose in action, a right to his proportionate share of the net proceeds of firm property upon a final settlement.

Powers of Partners. Each member of a normal partnership is the general agent of the firm and of his copartners in carrying on the ordinary business of the firm. He can sell and give a perfect title to firm property, can collect debts, and can subject the firm and his copartners to most extensive obligations both in contract and in tort.

How extensive a general partner's agency is depends upon the nature of the firm's business. His implied authority may be summarized as follows: if the partnership is a trading or commercial firm, he may sell or pledge any of its personal property; he may buy on credit such property as it is accustomed to deal in; he may borrow money and issue in the firm name negotiable paper; he may hire servants and agents; and he may render the firm and each copartner liable in tort by wrongful acts or omissions in the ordinary course of the business of the firm. Moreover, his admissions and representations made concerning the firm affairs and in the ordinary course of its business are receivable as evidence against the firm and his copartners when sued as such.

This implied agency of a partner may be withdrawn from him by his consent, as where the partnership articles confer the power of management upon particular members. It may be taken from him without his assent by a majority acting in good faith. Such limitations upon a partner's agency must, however, be brought to the knowledge of those dealing with the firm, or they will not be affected by them.

Duties of a Partner. The most important of these is his observance of the utmost good faith towards his copartners. Not only must he give the firm the benefit of every advantageous bargain he can make in the business, but he must

devote the whole of his time and energies during business hours to the promotion of its interests, unless the partnership contract otherwise provides. Moreover, if his copartners have been compelled to pay more than their shares of the firm debts and expenses, he is bound to contribute towards their indemnity.

Dissolution of Partnership. This may result by operation of law, or from the acts of the parties, or from judicial decree. The happening of any event which makes it unlawful for the business of the firm to be carried on, or for the particular contracting members to continue as partners, dissolves the firm at once, as does the death or the bankruptcy of a partner. The partnership may terminate by reason of an agreement made in advance that it shall continue for a fixed time, or it may be terminated at any time by mutual consent. Generally one partner may break up a firm against the wishes of his copartners, subject to his liability to damages for breach of his partnership contract.

A court will ordinarily decree a dissolution, at the request of a partner, upon the insanity or permanent incapacity of a member of a firm, or for the misconduct of one of the defendant partners, or when it appears that the business can only be carried on at a loss. As soon as a firm is dissolved the agency of the partners ceases, except so far as this is necessary for the purpose of winding up the firm's affairs. Sometimes a particular member is agreed upon as liquidating partner, to whom exclusive authority in settling firm matters is confided.

In winding up a partnership its assets are to be applied as follows: first, to paying the general creditors of the firm; second, to paying to each partner ratably what is due from the firm to him for advances as distinguished from capital; third, paying to each partner ratably what is due from the firm to him in respect of capital; fourth, the distribution of the residue, if any, shall be among the partners in the proportion in which profits are divided. If losses have been sustained these are to be paid first out of profits, next out of capital, and lastly, if necessary, by the partners individually in the proportion in which they were entitled to share profits. Of course, these rules may be varied, so far as their application to partners is concerned, by provisions in the partnership articles.

The law of partnership has to a large extent been codified in England by the Partnership Act (53 and 54 Vict., c. 39), which went into effect Jan. 1. 1891.

Consult: Theophilus Parsons, *A Treatise on the Law of Partnership* (4th ed., Boston, 1893); N. L. Lindley, *The Law of Partnership* (7th ed., Toronto, 1905); F. M. Burdick, *The Law of Partnership, Including Limited Partnerships* (2d ed., Boston, 1906); Frederick Pollock, *Digest of the Law of Partnership* (9th ed., London, 1909).

PARTON, ARTHUR (1842-1914). An American landscape painter, born at Hudson, N. Y. He was a pupil of W. T. Richards in Philadelphia and was elected to the National Academy in 1884. The coloring in his landscapes is usually in a low key, but his later work, with quite as much quality, has more vigor. His pictures include: "Palisades in Winter" (1885); "Misty Morning" (Brooklyn Institute); "Loch Lomond" (Art Association, Indianapolis); "Night in the Catskills" and "Evening—Harlem River" (both in the Metro-

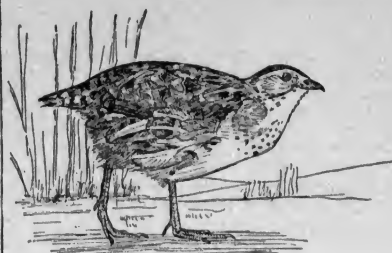
politan Museum, New York); "The Ledge" (1913); "A Spring Morning" (1914).

His brother and pupil, **ERNEST** (1845-), born at Hudson, also became known as a landscape painter. He resided in England after 1873. His paintings are simple in motive and combine refinement of tone with incisiveness of detail. Among the best known are "Waning of the Year" (Tate Gallery) and "Woodland Home" (Walker Gallery, Liverpool).

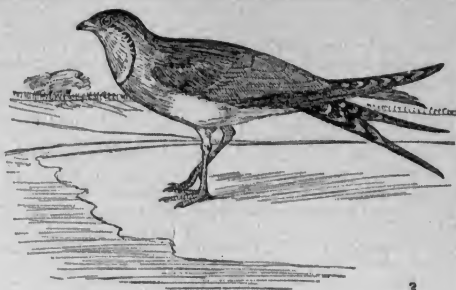
PARTON, JAMES (1822-91). An American author, born in Canterbury, England, Feb. 9, 1822. Parton was brought to the United States in 1827 and was educated in New York City and White Plains, N. Y. He taught in Philadelphia and New York and began a long literary career by journalistic work on the *Home Journal*. His first book was a *Life of Horace Greeley* (1855), which gained immediate success. He afterward devoted himself wholly to authorship and to lectures on political and literary topics, residing in New York until 1875 and afterward at Newburyport, Mass. His principal publications were: *Life and Times of Aaron Burr* (1857); *Life of Andrew Jackson* (3 vols., 1859-60); *General Butler in New Orleans* (1863); *Life and Times of Benjamin Franklin* (1864); *Famous Americans of Recent Times* (1867); *The Words of Washington* (1872); *Fanny Fern* (1873), a memorial to his wife; *Life of Thomas Jefferson* (1874); *Caricature and Other Comic Art in All Times and Many Lands* (1877); *A Life of Voltaire* (1881), his most meritorious production; *Noted Women of Europe and America* (1883); *Captains of Industry: A Book for Young Americans* (1884, 1891). In 1856 he married Sara Payson Willis (born at Portland, Me., July 9, 1811; died at Brooklyn, N. Y., Oct. 10, 1872), sister of the poet N. P. Willis, a popular authoress who wrote under the name of Fanny Fern. She left, by a former marriage to Charles H. Eldridge, a daughter, whom Parton afterward married.

PART OWNER. In its broadest sense, any person who owns property in common with another or others, except partners. Specifically, one of the coowners of a ship. Part ownership is not a partnership, even though the ship is operated for the common profit of the owners. They do not as such owners usually carry on a business in common. A partnership involves the notion of common and active participation in the management of an enterprise. Part owners may, indeed, transform this ownership into a partnership by agreement. Such transformation, however, will not be presumed; it must be proved. So long as they remain part owners they manage the vessel by, and delegate their interests to, various agents, of whom the principal are the ship's husband and the master. Formerly the ship's husband was generally in fact a part owner, but he need not own an interest in the vessel in order that his authority shall extend to all matters connected with its equipment, repair, and management. A majority of the part owners have the right to use the ship for a particular voyage against the will of the minority. When the majority exercise this power, however, a court of admiralty may require them to secure the minority owners to the extent of their shares. Consult James Kent, *Commentaries on American Law* (14th ed., Boston, 1896), and N. L. Lindley, *The Law of Partnership* (7th ed., Toronto, 1905). See **PARTNERSHIP**.

PARTRIDGES, ETC.



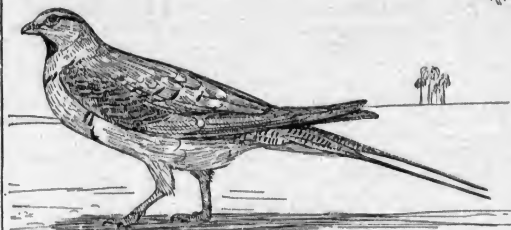
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1. COMMON EUROPEAN QUAIL (*Coturnix*).
2. PRATINCOLE (*Glareola pratincola*).
3. SAND GROUSE (*Pterocles alchata*).
4. CROWNED WOOD QUAIL (*Rollulus roulroul*).
5. CALIFORNIA VALLEY QUAIL (*Lophortyx californica*).
6. CALIFORNIA PLUMED or MOUNTAIN QUAIL (*Oreortyx picta*).
7. AMERICAN QUAIL or BOB-WHITE (*Colinus virginianus*).
8. RED-LEGGED PARTRIDGE (*Caccabis rufa*).

PARTRIDGE (OF. *perdris*, *perdris*, *pertrix*, Fr. *perdriz*, It. *perdice*, *pernice*, from Lat. *perdix*, from Gk. *πέδιξ*, partridge). A popular name for various gallinaceous birds, or other birds superficially like them, the precise application of which depends not only on the country but also on the part of the country where the term is used. The name was originally given, and properly belongs, to birds of the grouse family, of the genus *Perdix*, all of which are confined to the Old World. They have a short, strong bill, naked at the base; the upper mandible convex, bent down at the tip, the wings and tail short, the tarsi as well as the toes naked, the tarsi not spurred. In North America the term is hardly applicable properly, as our larger Gallinæ are grouse, while the smaller ones are preferably known as quails, although not precisely the same as the true quails (*Coturnix*) of the Old World. In the northeastern United States the ruffed grouse (see GROUSE) is almost universally called partridge, while in the Southern States the common quail (q.v.) receives that name and the grouse is known as pheasant. The term seems most properly applied in America to the small game birds of the Pacific coast, such as Gambel's partridge, and the mountain and valley partridges of California. In South America tinamous (q.v.) are called partridges.

The true partridge of the Old World is typified by the common gray partridge (*Perdix perdix*, or *cinerea*) of Great Britain and Europe generally, which is the most plentiful of all the game birds in Great Britain and becomes increasingly plentiful as cultivation is extended. On the continent of Europe it is abundant in almost all suitable districts from Scandinavia to the Mediterranean, and is found also in the north of Africa and in western Asia. It varies considerably in size, those found in rich lowlands are generally the largest and about 12½ inches in entire length, while those which inhabit poorer and more upland districts are rather smaller. The female is somewhat smaller than the male. The upper parts of both are ash gray, finely varied with brown and black, the male has a deep chestnut crescent-shaped spot on the breast which is almost or altogether wanting in the female. The partridge is seldom found far from cultivated land. It feeds on grain and other seeds, insects and their larvæ and pupæ, and the pupæ of ants are generally the food sought at first for the young. The nest is usually on the ground, among brushwood and long grass, or in fields of clover or corn, and generally contains from 12 to 20 eggs. Until the end of autumn the parent birds and their brood keep together in a covey; late in the season several coveys often unite into a pack, when it becomes much more difficult for the sportsman to approach them. The flight of the partridge is strong and rapid for a short distance, but the bird does not seem to be capable of long-sustained flight. The eggs of partridges are often hatched, and the young birds reared, by the domestic hen, the chief requisite being a plentiful supply of ants when the birds are very young. Partridges thus reared become very tame, but they seldom breed in the aviary. Other species occur in Asia.

Of a different genus is the red-legged or French partridge (*Caccabus rufa*), a native of southern Europe and now plentiful in the south of England, where it has been introduced. It

is rather larger than the common partridge, stronger on the wing, and less easily approached by the sportsman, while it is also less esteemed for the table. The upper parts are of a reddish ash color; the throat and cheeks white, bounded by a collar of black, which expands in black spots on the breast; and the sides exhibit bars of black. The plumage is smooth. Two other species nearly allied to this are found in southern Europe. India has a number of species, the habits of which much resemble those of the common partridge, the best known of which is the chukor (q.v.). In India, however, the name is extended by sportsmen to a large variety of small game birds, more or less like the true partridge, such as the bamboo partridges, hill partridges, and francolins (of which the black partridge, *Francolinus francolinus*, of the eastern Mediterranean region is a familiar example). In Australia one of the bush quails (*Pedionomus*) is so called, and in South Africa the redwing partridge of the colonists is a francolin (*Francolinus leuallanti*).

Bibliography. L. Lloyd, *Game Birds and Wildfowl of Sweden and Norway* (London, 1867); G. E. Shelley, *Birds of Egypt* (ib., 1872); Elliott Coues, *Birds of the Northwest* (Washington, 1874); Sharpe and Hudson, *Argentine Ornithology* (London, 1888); Mayer (editor), *Sport with Gun and Rod* (New York, 1892); H. A. Macpherson and others, *The Partridge* (London, 1894); H. A. Bryden, *Nature and Sport in South Africa* (ib., 1897); Morris, *British Game Birds* (ib., 1901); H. Seebohm, *Birds of Asia* (ib., 1901); Sandys and Van Dyke, *Upland Game Birds* (New York, 1902); C. E. A. Alington, *Partridge Driving* (London, 1904); J. G. Millais, *The Natural History of British Game Birds* (ib., 1910); Aymer Maxwell, *Partridge and Partridge Manors* (ib., 1911); H. K. Job, *Propagation of Wild Birds* (Garden City, N. Y., 1915), and writings of American naturalists and sportsmen generally. See Colored Plates of GAME BIRDS with article GROUSE and of EGGS OF WATER AND GAME BIRDS.

PARTRIDGE, ALDEN (1785-1854). An American educator, born at Norwich, Vt. He graduated at the newly founded Military Academy at West Point in 1806, was commissioned first lieutenant of engineers, and was assigned to duty there as assistant professor of mathematics. From 1813 to 1816 he was professor of engineering. In 1818 he resigned from the army and in 1820 returned to Norwich, where he founded the American Literary, Scientific, and Military Academy better known as the Norwich Military Academy. The success of this undertaking was immediate, and in 1834 the State granted it a charter as the Norwich University. At the invitation of other States Partridge founded similar military schools at Portsmouth, Va., Pembroke, N. H., Harrisburg, Pa., and Brandywine Springs, Del., and devoted much time to organizing and drilling their militia.

PARTRIDGE, BERNARD (1861-) An English caricaturist and illustrator. Born in London and educated at Stonyhurst College, he was first employed in an architect's office, then by a firm of stained-glass designers, and from 1880 to 1884 worked at church decoration under Philip Westlake. After trying the stage he at last found his true vocation as an illustrator and cartoonist. In 1892 he joined the staff of *Punch*, of which he later became the

principal cartoonist, making his mark instantly with his illustrations for Anstey's serials *Voces Populi* and *The Man from Blankley's* and with a series of clever society sketches. Partridge's work shows great facility, spontaneity, and power of rendering expression. Though his execution is sometimes scratchy his draftsmanship is good and his portraiture truthful. He also painted occasionally in oil and water color, and worked in pastel.

PARTRIDGE, JOHN (1644-1715). A London astrologer and almanac maker. Bound apprentice to a shoemaker, he nevertheless learned by himself Latin, Greek, and Hebrew, and seems subsequently to have studied medicine at Leyden. He wrote a treatise on the *Old Principles of Astrology* in 1697. In 1680 he had begun to issue an almanac called *Merlinus Liberatus*, which, after a short suspension, was regularly published from 1689. This masterpiece of equivocation soon became exceedingly popular. As a parody upon it Jonathan Swift issued at the beginning of 1708 *Predictions . . . by Isaac Bickerstaff, Esq.*, in which it was foretold that Partridge would "infallibly die upon March 29 next, about 11 at night, of a raging fever." On March 30 Swift published a pamphlet in which the prediction was said to be accomplished. In vain Partridge spent the rest of his life in trying to convince the public that he was still alive. Swift followed up the humorous attack in an *Elegy on the Death of Mr. Partridge* (1708) and the *Vindication of Isaac Bickerstaff* (1709). Partridge was so completely crushed that not another *Merlinus* appeared till 1714. Partridge's *Almanac*, issued by the Stationers' Company in 1711, appeared regularly at least until the last decade of the nineteenth century. The name Isaac Bickerstaff (q.v.), which Swift took from a sign in Longacre, soon spread far and wide. It was appropriated by Steele in the *Tatler* (1709).

PARTRIDGE, WILLIAM ORDWAY (1861-). An American sculptor and author, born in Paris. He attended Columbia University in 1885, and studied modeling in Paris, then under Galli in Florence and Welonski in Rome. He first became known by his well-characterized portrait busts. One of his first large works, the bronze statue of Hamilton, in Brooklyn, N. Y., is a striking conception of the great statesman in a moment of dramatic interest. Other notable statues are: Shakespeare, unveiled at Lincoln Park, Chicago, in 1894; the bronze equestrian statue of General Grant (1896), in Brooklyn; Pocahontas, at Jamestown; Nathan Hale, at St. Paul and at Washington; Alexander Hamilton and Thomas Jefferson, at Columbia University. His largest ideal work is the Kauffman Memorial in Rock Creek Cemetery, Washington. Other work includes a noble "Madonna" (1893), Brooklyn Museum; the baptismal font for the cathedral of Sts. Peter and Paul, Washington (1905); group of Christ and St. John, Brooklyn Museum; Schermerhorn Memorial for Columbia University, New York; a "Pietà," in St. Patrick's Cathedral, New York; and the ideal heads of "Peace" (Metropolitan Museum), "Destiny," and "Nearing Home" (Corcoran Gallery, Washington). But Partridge is perhaps at his best in his busts of the poets Whittier (Boston Public Library), Tennyson (owned by Henry van Dyke), Burns, and Longfellow. His work shows refinement, imagination, and versatility of

technique. In later years he frequently experimented with new impressionistic methods. He also became well known as a lecturer and writer on art and letters. His publications include *Art for America* (1894); *Song Life of a Sculptor* (1894); *The Technique of Sculpture* (new ed., 1906); *The Angel of Clay* (1900), a novel; *Nathan Hale* (1902); *The Czar's Gift* (1906), a novel. Consult *The Works in Sculpture of William Ordway Partridge, with Biographical Sketch* (New York, 1914).

PARTRIDGE BERRY (*Mitchella repens*), sometimes called CHECKERBERRY. This plant, named for Dr. John Mitchell, an early American botanist, is a smooth, trailing, evergreen plant with round or ovate shining leaves, sometimes streaked with white, and fragrant white flowers, sometimes streaked with purple. These are suc-



PARTRIDGE BERRY (*Mitchella repens*).

ceeded by edible berries which are usually scarlet and remain on the plant over winter. The partridge berry is commonly found in dry woods from Nova Scotia to Minnesota and south to Texas, growing about the bases of trees. *Mitchella repens* belongs to the family Rubiaceæ. It is also called squaw vine and twin flower, the latter name from the fact that the flowers are often borne in pairs. The plant is reputed to have medicinal properties.

PARTRIDGE COCHIN. See Plate of POULTRY

PARTRIDGE DOVE, or PARTRIDGE PIGEON. An Australian pigeon of the genus *Geophaps*, approaching in character and habits to the gallinaceous birds and particularly to partridges. The plumage has a bronze tinge and lustre on the wings, which resembles that of the closely allied bronzewing (q.v.). There are several species. They live mostly on the ground, and rise with a whirring noise, like the pheasant, when disturbed. They are highly esteemed for the table. *Geotrygon montana*, a species of another genus, bears the name partridge dove in the West Indies. It also seeks its food chiefly on the ground, although it affects well-wooded districts.

PARTRIDGE WOOD. A very pretty, usually reddish, variously streaked hard wood from the West Indies and Brazil, where it is used in

shipbuilding. In choice specimens the layers of wood are curled upon one another so as to resemble the feathers of the partridge; hence its name. Its chief use in other countries is for cabinetwork, canes, parasol sticks, fans, and other small articles. It is said to be yielded by *Andra mermis*, a leguminous tree referred by some botanists to the genus *Vouacapoua*.

PARTSCH, *pärch*, JOSEPH (1851-). A German geographer, born at Schreiberhau, Silesia. He studied at the University of Breslau, receiving his doctorate in 1874, and began teaching at the university, becoming later professor of geography. Here he remained until 1905, when, on the death of Ratzel, he was called to the chair of geography at the University of Leipzig. His earlier writings were devoted to classical geography, but in later years he wrote extensively on glacial geology, the history of geography, and regional geography. In the last group are some of his best-known works, such as the systematic monographs on the Ionian Islands, the standard geography of central Europe, and the geography of Silesia. Among English-speaking people he is best known as the author of *Central Europe* (English, 1903, German, 1904), the English edition, prepared by H. J. Mackinder, appearing in the series "The Regions of the World." This book is of particular value for its account of the physiography of the region which became the battle ground of Europe (1914 et seq.) and especially for the last chapter, "The Conditions of National Defense."

PARTS OF SPEECH. See GRAMMAR, *Parts of Speech*.

PARTURIENT APOPLEXY, or PARESIS. A disease of live stock. See MILK FEVER.

PARTURITION. See OBSTETRICS.

PARTY NAMES (OF, *Fr* *partie*, from *ML partita*, party, part, *Lat. partita*, fem sing of *partitus*, p p of *partiri*, to divide). The following is a partial list of the political groups which have existed in the United States, Great Britain, and Canada, some of which, however, were never definitely organized as parties; also some which, while of apparently religious origin, exerted a distinct political influence.

Abolitionists—Those who strove to secure the abolition of slavery. (See article on this title.)

Adamites—The political supporters of John Quincy Adams. The expression was current from about 1821 to 1832. **Adullamites**—The name given to a group of seceding British Liberals in 1866. (See article on this title.) **American Party**—A party which originated in New York in 1835, and which was organized as a national party about 1852. Its purpose was expressed in the motto "America for Americans." Later it became known as the Know-Nothing party. It had practically disappeared by 1856. The name was also applied to two other parties in the history of the United States. (See AMERICAN PARTY; KNOW-NOTHINGS.)

Anti-Federalists—The name applied to those who opposed the adoption of the Constitution of the United States. (See ANTI-FEDERALISTS.)

Anti-Imperialists—(See IMPERIALISM.) **Antimasons**—A party which originated in New York in 1826, its chief principle being hostility to the Masonic Order. (See ANTIMASONS.)

Anti-Nebraska Party—A party formed in 1854 after the enactment of the Kansas-Nebraska Bill and composed mainly of Northern Whigs who were opposed to the repeal of the Missouri Com-

promise. **Antirenters**—The name applied to those in New York who opposed the collection of rent from the tenants occupying the old patroon estates. The movement flourished during 1839-47. (See ANTIRENTISM.) **Baldwin Reformers**—(See POLITICAL PARTIES, *Canada*.)

Barnburners—The radical wing of the Democratic party in New York for several years after 1844. They were arrayed against the Hunkers (q.v.), who were more practical men and who were supported by the Tammany Society. (See BARNBURNERS.) **Black Republicans**—The name applied, chiefly in the South at the close of the Civil War, to those supporting the Republican party, on account of their sympathy for the negro. **Bourbons**—Originally applied to the Southern Democrats of the old school, but now used of any reactionary who adheres obstinately to tradition. **British-American League**—A Canadian political party formed in 1849 to counteract the manifesto for annexation to the United States issued in Montreal the same year. The league upheld British connection, a national policy of protection, and advocated the federation of the British North American provinces.

Bucktails—A political faction originating in New York in 1815 and opposed to the administration of Governor Clinton. They were so called from the habit of wearing bucktails in their hats. **Canada First**—A political party formed in Canada in 1874 to emphasize the feeling for nationalism. Its headquarters were in Toronto. Its radical element looked to independence, but a considerable number favored British connection. Its organization was not effective, and the party soon ceased to exist. **Carpetbaggers**—(See article on this title.)

Cavalier—(See article on this title.) **Chartists**—(See CHARTISM.)

Clan-na-Gael—(See article on this title.) **Clear Grits**—A Canadian political party, so named because no half-hearted supporters were to be tolerated, but only those who were "clear grit."

Its founders were advanced Reformers or Liberals whose dissatisfaction with the moderate element of their party led to the demand for universal suffrage, elective officials and institutions, biennial parliaments, and other reforms in part resembling those demanded by Chartism (q.v.). It was founded in 1851, but lacked coherence and soon ceased to be politically efficient. Much of the spirit which animated it was revived in the Canada First party. The term "Grit" was afterward applied to the Liberal party as a nickname. **Conservatives**—(See POLITICAL PARTIES, *Great Britain*.)

Constitutional Union Party—A party organized in 1860 and composed mainly of former Southern Whigs. (See CONSTITUTIONAL UNION PARTY.)

Copperheads—The name applied by the Republicans during the Civil War to the Democrats of the North who did not believe in prosecuting the struggle with the South and some of whom sympathized with the cause of the Confederates. (See COPPERHEADS.)

Cooperationists—The term applied at the time of the secession controversy in the Southern States to those who favored the secession of their own State only in the event of "coöperation" of their sister States. **Court Party** (old and new)—The term applied to the supporters of two rival superior courts in Kentucky. (See KENTUCKY.)

Covenanters—(See COVENANTS, THE.) **Croppies**—(See article on this title.)

Democratic Republicans—(See DEMOCRATIC PARTY.) **Democrats**—(See DEMO-

CRATIC PARTY.) *Doughfaces*.—The name sneeringly applied by John Randolph, of Roanoke, about 1820, to Northern members of Congress who supported the slavery interests by their votes. *Dryes*.—Another term for those favoring the prohibition of the liquor traffic. *Equal Righters*.—A Canadian political party organized in 1889 in Toronto, Ontario, to procure the disallowance of the Jesuits' Estates Act of 1888 and generally to oppose the alleged political encroachments of the ultramontane Roman Catholics of Canada. It had able supporters in the Dominion Parliament, and gave effective assistance in settling the Manitoba school question. (See MANITOBA, *History*.) *Fair Traders*.—The name applied towards the close of the nineteenth century to the British opponents of Free Trade, which they considered one-sided and therefore to be remedied by trade based on fair conditions of reciprocity between the nations concerned. Fair Traders were mostly Conservatives, and their object was an Imperial customs union between Great Britain and her colonies. It was put forward as the economic basis of Imperial Federation. *Family Compact*.—A group of Tory leaders and families in Upper Canada (Ontario), so named because they held power as a distinct body united by ties of social, religious, and political sympathy. They monopolized the public offices, but their power was overthrown by the Upper Canada rebellion of 1837-38. *Federalists*.—(See article on this title.) *Femians*.—(See FENIAN SOCIETY.) *Fifth-Monarchy Men*.—(See article on this title.) *Free-Soilers*.—A party which first came into prominence in 1848. It was made up of men opposed to the extension of negro slavery. (See FREE-SOIL PARTY.) *Gold Democrats*.—A party of disaffected Democrats who refused to support the regular party platform and candidates in 1896. They adopted a platform favoring the gold monetary standard and nominated J. M. Palmer, of Illinois, for President. *Grangers*.—(See article on this title.) *Greenbackers*.—A party advocating the issue of an irredeemable paper currency. It was prominent during the decade from 1876 to 1886. (See GREENBACK PARTY.) *Half-Breeds*.—The moderate wing of the New York Republicans, 1881-85, opposed to the Stalwarts (q.v.). *Hards*.—A name applied to one of the Democratic factions in New York prior to the Civil War. They were opposed to the "Softs." *Hunkers*.—(See HUNKERS.) *Imperial Federationists*.—(See IMPERIAL FEDERATION.) *Imperialists*.—(See IMPERIALISM.) *Irish Nationalists*.—(See POLITICAL PARTIES, *Great Britain*.) *Jacksonites*.—The followers of Andrew Jackson, 1825-29, opposed to the Adamites. *Jacobites*.—(See article on this title.) *King's Friends*.—The name applied to the political party which supported George III in his attempts to increase the royal power. It was active in upholding the King and Lord North in their efforts to tax the American Colonies. *Know-Nothings*.—(See article on this title.) *Labor Party*.—(See POLITICAL PARTIES, *Great Britain*.) *Land Leaguers*.—The name applied for some time to the supporters of Charles Stewart Parnell, leader of the Irish party, after he had become president of the Land League (q.v.). *Lollard*.—(See LOLLARD.) *Loyalists*.—(See article on this title.) *Liberal-Conservatives*.—The name applied to the Conservative party of Canada under the leadership of Sir John A. Macdonald (q.v.). *Liberals*.—(See

POLITICAL PARTIES, *Great Britain and Canada*.) *Liberals or Liberal Republicans*.—Those Republicans who opposed the reelection of President Grant in 1872 and favored a more liberal policy as regards the Southern question. (See LIBERAL REPUBLICAN PARTY.) *Liberal-Unionists*.—(See POLITICAL PARTIES, *Great Britain*.) *Liberty Party*.—A party which was formed about 1840 for the purpose of securing the abolition of slavery. (See article on this title.) *Lily Whites*.—The term applied to white Republicans in the South who favor the exclusion of negroes from the party. *Loco Focos*.—A popular nickname given to a faction of the Democrats in New York during the administration of Van Buren. (See article on this title.) *Loose Constructionists*.—The term applied frequently to the Federalists and later to the Whigs, on account of their advocacy of a liberal interpretation of the Constitution of the United States. *Mahonists*.—A party in Virginia consisting of the followers of Gen. William Mahone, who bolted from the Democratic party in 1878. (See READJUSTERS.) *Middle-of-the-Road Populists*.—(See POPULIST PARTY.) *Mugwumps*.—(See article on this title.) *Nationalists*.—The name of a French-Canadian political party formed to conserve the privileges and promote the development of the French-speaking race in Canada. It claims exemption of the French from the foreign complications to which Canada is liable on behalf of Great Britain. Its most conspicuous leaders are Honoré Mercier (q.v.) and Henri Bourassa (q.v.). *National Republicans*.—(See WHITE PARTY.) *Native Americans*.—(See KNOW-NOTHINGS.) *Nullifiers*.—Those who advocated the right of a State to suspend within its own boundaries the operation of a law of the United States. Only in South Carolina, 1828-32, did this become the basis of a party organization. (See NULLIFICATION.) *Orangemen*.—(See article on this title.) *Parti Rouge*, or the *Quebec Rouges*.—The name applied to a political party of French-Canadian Liberals, formed about 1849. Its adherents at first avowed republican opinions which had spread from France, but later grew more moderate and held the principles which actuated British Constitutional Liberals. They coöperated with the Upper Canada Reformers who fought for responsible government, and they stood for freedom of speech and resistance to ecclesiastical domination. *Patriotes*.—A name assumed by the popular French party in Lower Canada immediately before and during the rebellion of 1837-38. It was specially applied to the followers of L. J. Papineau. As a party it disappeared after the rebellion, but much of its spirit was revived in the Parti Rouge. *People's Party*, or *Populist Party*.—A political party first organized on national lines in 1892. (See POPULIST PARTY.) *Progressive Party*.—A party organized at Chicago in 1912 under the leadership of ex-President Roosevelt. (See PROGRESSIVE PARTY.) *Puritans*.—(See article on this title.) *Prohibitionists*.—Those who advocate abolition of the liquor traffic. Since 1872 there has been a national Prohibition party. (See PROHIBITION.) *Radicals*.—The name applied after the Civil War to the extreme wing of the Republican party as regards its policy in dealing with Southern questions. (See also RADICALISM and POLITICAL PARTIES, *Great Britain*.) *Readjusters*.—A local party in Virginia in 1878 headed by Gen. William Mahone and favoring a conditional repudiation of

the State debt. (See *READJUSTERS*.) *Repealers*.—A political party in Nova Scotia which urged the withdrawal of that province from the Canadian Confederation. *Repudiators*.—A party in Mississippi which advocated the repudiation of a large number of Union bank bonds, the payment of which the State had guaranteed. (See *REPUDIATION*.) *Relief Party*.—The name applied to the supporters of a movement in Kentucky which had for its purpose the enactment of measures by the Legislature for relieving the people of economic and financial burdens. "Relief" parties were common in other States from 1830 to 1860. (See *KENTUCKY*.) *Republicans*.—(See *REPUBLICAN PARTY*.) *Roundheads*.—(See article on this title.) *Scalawags*.—The name applied to native Southerners during the reconstruction era who affiliated with the Republican party. *Silver Grays*.—The conservative wing of the Whig party. *Silver Party*.—A party made up chiefly of disaffected Republicans in 1896, who favored the free coinage of silver. It indorsed the Democratic nominees for President and Vice President in that year. *Socialists*, or *Socialist-Labor Party*.—This first appeared as a national movement in 1892, when it nominated candidates for President and Vice President and adopted a platform advocating a Socialistic policy in governmental affairs. *Stalwarts*.—A wing of the Republican party in New York from 1880 to 1885, led by Roscoe Conkling and representing the "machine" politics of the party. (See article on this title.) *Strict Constructionists*.—The name given to those who advocated the strict interpretation of the Constitution of the United States. (See article on this title.) *Suffragettes*.—The name of the British women's political party which contends for the franchise by methods known as militant. (See *WOMAN SUFFRAGE*.) *Suffragists*.—The name of a women's political group which contends for the franchise by constitutional methods. It has adherents both in Britain and the United States. (See *WOMAN SUFFRAGE*.) *Ulsterites*.—The name of a political group in Ulster and in other parts of Ireland strongly Protestant, which opposed Irish Home Rule. Its leader was Sir Edward Carson (q.v.). *Ultramontanists*.—(See article on this title.) *Union Labor Party*.—A movement which first became national in 1888. It nominated candidates for President and Vice President and adopted a platform of principles. *Union Leagues*.—Organizations of a political character in the Southern States for a time after the Civil War, composed chiefly of negroes and white Republicans. *United Empire Loyalists*.—(See *LOYALISTS*.) *Washingtonians*.—The term early applied to the Prohibition party *Whigs*.—(See *WHIG PARTY*; also *WHIG AND TORY*, and *POLITICAL PARTIES, Great Britain*.) *Woman's Rights Party*.—A party which first appeared as a national movement in 1884. Both in that year and in 1888 it held national conventions and nominated candidates for President and Vice President, pledged to advocate the general introduction of female suffrage.

PARTY WALL. A wall dividing adjoining properties in which the owners of the respective parcels have common rights as to its use and maintenance. By the English common law, where the wall is partly on both lots, the adjoining proprietors are presumed to be tenants in common of the wall and probably of the land on which it stands. In the United States, if the wall stands so that it is partly on both lots, the

owner of each lot retains the fee in the part of his land covered thereby and also owns the portion of the wall standing on his lot, subject, however, to the easement of support incident to a party wall, in favor of the adjoining owner.

A party-wall easement may, like any other easement, be created by grant, by prescription (or, generally, 20 years' user), and in a few States by virtue of statutes authorizing a person under certain circumstances to build a party wall between his land and that of his neighbor and to exact contribution from the latter. The weight of authority in the United States is to the effect that statutes of this nature are unconstitutional, as taking private property without compensation for private purposes. In the few States where such statutes exist they are held valid as a legitimate exercise of the police power. Neither owner of a party wall has a right to extend the front and rear walls of his building farther than to the middle of the party wall, nor is either entitled to maintain a window therein, even if the other party is not using his side. Either owner may increase the height of a party wall, provided the wall is thick enough to bear the increased weight, or may increase its thickness on his own land. When a party wall becomes unsafe or dangerous, either party may repair it, even to the extent of rebuilding it, without causing injury to the other, but the one repairing or rebuilding cannot in general require the other to pay any part of the cost thereof. In most jurisdictions it is held that if the wall is totally destroyed from any cause the easement is at an end, and neither party can rebuild without the consent of the other. Where a wall is rebuilt by consent, it is generally considered that the party-wall easement revives without a new grant. See *EASEMENT*.

PAR VA'GUM. See *PNEUMOGASTRIC NERVE*.

PARVATI, par'wà-tē (Skt., mountain born). In Hindu mythology, the beneficent aspect of the wife of Siva (q.v.). She was a reincarnation of Um (q.v.), and was born as a daughter of Himavat or the Himalaya Mountains, from which circumstance she received her name. According to another account, she was the daughter of the combined glances of Brahma (q.v.), Vishnu (q.v.), and Siva, and was born on Mount Kailasa in the Himalaya. She was then white, red, and black, the colors of Brahma, Vishnu, and Siva respectively, but at Brahma's request divided herself into three forms, of which the white, Sarasvati, was the wife of Brahma; the red, Lakshmi (q.v.), the wife of Vishnu; and the black, Parvati, the wife of Siva. Parvati plays little part in Hindu mythology, manifesting her power chiefly under her aspects of Durga (q.v.) and Kali (q.v.). Consult W. J. Wilkins, *Hindu Mythology* (2d ed., London, 1900), and see, for illustration, Plate of *HINDU DEITIES* in the article *INDIA*.

PARVIN, THEOPHILUS (1829-98). An American obstetrician. He was born in Buenos Aires, was a graduate of the universities of Indiana and of Pennsylvania (M.D., 1852), and after a dozen years' practice in Indianapolis became professor in the Ohio Medical College (1864). From 1869 to 1872 he taught in the medical department of the University of Louisville, then was professor of obstetrics and infantile diseases in Indiana Medical College, and in 1883 was chosen to a like chair in Jefferson Medical College, Philadelphia. Dr. Parvin was president of the Indiana State Medical Society

in 1861 and of the American Medical Association in 1879. He wrote *The Science and Art of Obstetrics* (1886) and edited *Winchel on the Diseases of Women* (1887).

PASADENA. A city in Los Angeles Co., Cal., 9 miles by rail northeast of Los Angeles, on the Southern Pacific, the Atchison, Topeka, and Santa Fe, and the Salt Lake railroads (Map: California, G 8). It is an attractive residential place and a well-known winter resort, its healthful climate and beautiful situation contributing to its popularity. Green Hotel, Maryland Hotel, Hotel Huntington, and Raymond Hotel are among the most prominent buildings of Pasadena. There are also the Throop College of Technology, a public library containing 45,000 volumes, a \$200,000 high-school building, and several beautiful parks. Of interest in the vicinity are the Busch Sunken Gardens, Oak Knoll, the Carnegie Solar Observatory, and the San Gabriel Mission. Pasadena was settled in 1874 by a colony from Indianapolis and soon became known for its horticultural enterprise. It is the centre of extensive fruit-growing interests, the cultivation of oranges and lemons being especially important. There are large packing houses, many drying establishments, a large cannery, flour mills, and manufactures of woodwork, boots and shoes, cut glass, and brick. Pasadena was first incorporated in 1886 and in 1913 adopted the commission form of government. The water works and electric-light plant are owned by the city. Pop., 1900, 9,117; 1910, 30,291; 1914 (U. S. est.), 40,880.

PASANG, pā'zang. See GOAT, and Plate of WILD GOATS, SHEEP, ETC.

PASARGADÆ, pā-sīr'gā-dē (Lat., from Gk. *παρσαργάδαι*). The ancient capital of Persia and royal seat of Cyrus prior to the founding of Persepolis (q.v.) by Darius. The etymology of the name is uncertain, and the suggestion that it may have represented a Græcized form of a presumable OPers. *Pārsa-vardana* (city of Persia), equivalent in meaning to *Persepolis*, would have to be reconciled with the fact that according to Herodotus, the name Pasargadæ was also a designation of one of the three noblest tribes in early Persia. The site of the city of Pasargadæ in antiquity has been positively identified through ruins which still exist, particularly the Tomb of Cyrus the Great, as located in the Plain of Murghab, about 40 miles northeast of Persepolis, on the main highway between Ispahan and Shiraz. This plain, some 9 by 15 miles in expanse, is surrounded by mountains and watered by the small river Pulvar. The ruins lie largely in its western part.

On this spot was founded Cyrus's Imperial capital, and the presence of mountain barriers, which practically guard against access by a hostile invader, apparently precluded the necessity of fortified walls, as traces of these seem to be lacking so far as archaeological researches have revealed.

As one approaches the ruined remnants of Pasargadæ, in following the road southward towards Shiraz, one sees first, on the left of the highway, the remains of a massive platform which crests the height of a low ridge and overlooks the plain. It is constructed of immense blocks of carefully hewn stone and apparently remained unfinished, but is believed to have been designed as a royal audience platform of Cyrus that antedated the great palace terrace

of Darius, Xerxes, and their successors at Persepolis. The natives call this megalithic platform the Throne of the Mother of Solomon (*Takht-i Madar-i Sulaimān*) or simply Solomon's Throne (*Takht-i Sulaimān*), for Mohammedan tradition has obliterated the historic significance of the structure.

Farther westward stand the remains of a towering wall which once formed a portion of a solid square stone building, locally known as Solomon's Prison (*Zindān-i Sulaimān*), but which must have once been either a fire temple or a tomb. At some distance to the northeast of the Prison are found likewise two ancient fire altars of stone (*Ātash-gāhs*).

Several hundred yards southwestward from the Prison is a pilaster or angle pier of a noble building that is now traceable only by vestiges. This corner post is composed of three rectangular blocks of a yellowish-white limestone, rising 20 feet high, and still bears an inscription, chiseled in cuneiform letters in three languages, Old Persian, Elamitic, and Babylonian, with the words "I, Cyrus the King, the Achæmenian." The same device is repeated on the three angle piers (for the fourth is missing) of another ruined edifice lying somewhat to the southwest and locally known as *Divān-i Khānah* (Hall of Audience). In this ruin are perhaps to be traced the remnants of a larger palace of Cyrus, strikingly marked by a lone cylindrical column of limestone, over 30 feet high, the lower of whose three smooth drums forms a part of the supporting base of the shaft.

Not far to the southeast of these remains are the vestiges of still another collection of ruins, comprising bases of doorways and pedestals of white stone, which seem to be the traces of a smaller palace. Associated with these in noteworthy manner is a famous monolith which bears an Achæmenian bas-relief, well known because often depicted. It consists of a huge slab of gray limestone, now much weathered, over 12 feet high, 5 feet broad, and about 2 feet thick. On its surface is carved in low relief a majestic human figure, bearded, and surmounted by a crown which shows Egyptian affinities, while from the shoulders rise and droop to the feet two sets of magnificent wings. A cuneiform inscription, "I, Cyrus the King, the Achæmenian," once decorated the top, as is proved by the drawings of travelers who described and sketched the monument before the middle of the nineteenth century, but the inscription has since disappeared owing to the act of some vandal who cut off the upper part of the block. Judging from the device that once capped the monolith, it seems probable that the bas-relief represented an idealized portrait of the great King Cyrus, but some scholars prefer to regard the image merely as a symbolic figure.

Last, but most important of all from the standpoint of history, is a structure near the extreme west or southwest of the plain. This is the Tomb of Cyrus the Great, identified through the classic records of those who accompanied Alexander the Great, who twice visited the tomb in his invading march through Persia. The mausoleum is a massive low stone building, houselike in shape, with a gabled roof, and it surmounts a terraced base of six stages or courses of stone resting on a plinth as foundation. The dimensions of the plinth are some 50 feet in length and 40 feet in width, upon which rise the stages on which the sepulchral monu-

ment is built. The point of its gabled roof is elevated some 35 feet above the ground. The sepulchre itself measures about 18 feet high, 20 feet long, and 17 feet broad, with a small entrance to the mortuary chamber. It is constructed of huge blocks of limestone that may well be mistaken for marble. Classic authors mention an epitaph, but if it existed over the doorway it has long disappeared, though the trained eye of the archæologist may still fancy to see traces of where it once was. Near it are the remains of the foundation of a building which may have been at the time a sanctuary of the Magian priests, who were the custodians of the Tomb of Cyrus, as Arrian says (*Anab.*, 6, 29, 7).

Consult: Curzon, *Persia and the Persian Question* (London, 1902); A. V. W. Jackson, *Persia Past and Present* (New York, 1906); Herzfeld, "Pasargadæ, Untersuchungen zur persischen Archäologie," in *Klio*, vol. viii, 1-68 (Leipzig, 1908); id., "Pasargadæ," in Sarre and Herzfeld, *Iranische Felsreliefs*, vol. ii, 147-186 (Berlin, 1910); Sykes, *History of Persia*, vol. i, pp. 189-191 (London, 1915); also the earlier authorities cited under PERSEPOLIS.

PASCA, pās'kā', ALIX MARIE ANGELE SÉON (known as MADAME PASQUIER) (1835-1914). A French actress, born at Lyons. In 1855 she was married to Alexis Pasquier and after his death made her theatrical début in 1864 at the Gymnase, Paris, in the *Demi-Monde*. Her reputation was firmly established in 1866 by the rôles she created in *Idées de Mme. Aubray* and especially in *Fanny Lear*. In 1870-74 she achieved a remarkable success at the Michel Theatre at St. Petersburg. She then appeared in London, and, returning to Paris, played in *La Charbonnière* (1884) at the Gaiety and in Curel's *L'Invitée* (1893) at the Vaudeville.

PASCAGOULA, pās'kā-gōō'lā. A city and the county seat of Jackson Co., Miss., 100 miles east of New Orleans, La., on the Pascagoula River and on the Louisville and Nashville and the Pascagoula-Moss Point Northern railroads (Map: Mississippi, H 10). Noteworthy structures are the high-school buildings, a Roman Catholic convent, and the county courthouse. There are fish and oyster, lumbering, and fruit-growing interests. A dock and naval machine shops are maintained here by the Federal government. Pop., 1900, 708; 1910, 3379.

PASCAGOULA RIVER. A river of Mississippi, formed by the junction of the Leaf and the Chickasawhay, both flowing southward through the southeastern part of the State (Map: Mississippi, H 9). It empties by two mouths, about 2 miles apart, into Mississippi Sound, 23 miles west of Mobile Bay. With its main head stream, the Chickasawhay, the Pascagoula is 250 miles long. It is navigable to Moss Point, 7 miles from its mouth. The stream is used as a waterway for timber cut on the pine barrens through which it flows.

PASCAL, pās'kāl', BLAISE (1623-62). A distinguished French philosopher, mathematician, and author, born at Clermont-Ferrand. He came of an Auvergnat family, ennobled in 1478 and for generations employed in the civil service. His mother died in his infancy, and his father moved in 1631 to Paris. Here he was educated by his father and showed remarkable precocity in mathematics. In 1641 the family removed to Rouen, where for a number of years Pascal was engaged in scientific studies, especially in phys-

ics. In 1648 his sister Jacqueline was attracted to the Jansenist convent at Port-Royal, and Pascal frequently accompanied her there, till their father took them both to Clermont, where Pascal remained for two years. In 1650 the family returned to Paris, and the next year the father died; Jacqueline joined Port-Royal, but Pascal remained in Paris till 1654, when he followed her thither. His decision to embrace the austere life of Port-Royal is said to have been caused by a carriage accident, though it is quite clear from minor writings of this period, such as *Prière pour demander le bon usage des maladies* (1648) and *Lettres sur la mort du père de M. Pascal* (1651), that the Jansenist faith and what is uncritically called Pascal's skepticism were already firmly fixed in his mind. From this moment he gave himself utterly to Port-Royal, continuing to believe in and labor for the progress of science, though sure that mental and moral certitude could be found only in revelation. He was not then a theologian, and he never acquired more than a superficial acquaintance with the fathers of the Church. Yet, with the equipment of his unsurpassed literary instinct and scientific training, he entered on his famous controversy with the Jesuits in the 18 *Lettres provinciales*. They were published clandestinely and pseudonymously in 1656 and 1657. The title of the collected letters reads: *Lettres écrites par Louis de Montalte à un provincial de ses amis et aux RR. PP. Jésuites; sur la morale et la politique de ces pères*. Subsequently the collection was entitled simply *Les provinciales*. It is evident that they were written under intense excitement, stimulated by the supposed miraculous cure of his niece through contact with a relic of the crown of thorns at Port-Royal. The letters were immensely popular and successful, but brought down both ecclesiastical and civil censures upon the unknown author. They are perhaps the greatest masterpieces in the literature of irony; there is no trace of declamation or of indignation, only a contemptuous smile, an insinuation of sarcasm, which in the latest letters yields occasionally to a stern but not impassioned invective, less effectual and less agreeable than the earlier manner. Pascal's style is unsurpassed in graceful energy and brilliant wit. It lacks tenderness and melody, but has the characteristically French virtues of being sharp, clear-cut, compact, and yet full in its utterance. He is the first French prose writer thoroughly at home with rhetorical tools. There has been gradual adaptation to new needs, but French prose has neither made nor needed to make a great advance since the *Lettres provinciales*. Considered, however, from the point of view of honest controversy, they cannot be praised so highly. At best they are special pleadings and do not represent the general spirit of the Jesuit Order. Accurate scholarship has pointed out numerous passages which misquote or misapply the authors quoted, or distort an *obiter dictum* of some obscure Jesuit, sometimes even a proposition condemned by the society, into its official teaching. His colleagues at Port-Royal, especially Nicole, furnished materials and collected references, and others were taken from a Calvinist collection published at Geneva in 1632. Pascal's part was that of the earnest and convinced barrister who pleads a case from materials put into his hands by others. He himself said, it is true, that he had read Escobar

through twice and had never used a passage from any author without having looked it up with its context. The real issue, however, is not between Jesuits and Jansenists, but between Puritanism and Probabilism. Pascal leads an ascetic reaction against the naturalism of the sixteenth century as we find it, on the one hand, in Rabelais and Montaigne, and, on the other, in Ronsard and the Classicists. This double movement of the Renaissance the Jesuits had sought to reconcile with Christianity by their ethics. Against this Pascal makes a Puritan and Augustinian protest, somewhat as Calvin had made it in a previous generation. The critic Brunetière thinks that Pascal made a mistake in scoffing at casuistics while he attacked Probabilism, and that in seeking to ruin the moral credit of the Jesuits he directed a blow against religion itself, which might have had serious consequences had it not been in some degree parried by Pascal's second great work, *Pensées sur la religion et sur quelques autres sujets* (1670).

For Pascal had not yet finished *Les provinciales* when he conceived the idea of supplementing this destructive work of criticism by a constructive *Apologie de la religion chrétienne*, by which, of course, he meant Jansenism. At this he worked serenely, though with much physical suffering and some self-inflicted refinements of asceticism, until his death, in 1662. He left it little more than a series of disconnected fragments, published with omissions, alterations, and some errors of mere carelessness in 1670. A more exact text, edited by Faugère, appeared in 1844. The general idea of the work is obvious if we conceive it to be a book of Jansenist apologetics. Pascal urges the wretchedness of man in himself and in his environments, the impotence of reason, the protest of despair, the invincible hope of better destiny, the solution of the difficulty in the doctrine of original sin, and the consequences of the acceptance of that doctrine, viz., expiation and redemption, dogmas foreshadowed in the Old Testament, confirmed by miracles, forming the essentials of Christianity, and credible by an effort of will.

Pascal's work in mathematics was also of considerable importance. He was the first one to attempt a philosophy of mathematics. When only 16 years old, he wrote a work on the *Geometry of Conics* (1639), most of which is lost, though a fragment has been restored from his correspondence with Leibnitz. It contained two important theorems, the one which is known as Pascal's theorem (see CONCURRENCE AND COLLINEARITY), and another, due to Desargues, that if a straight line cut a conic in P and Q , and the sides of an inscribed quadrilateral in A, B, C, D ,

we have the following relations: $PA \cdot PC \cdot QA \cdot QC = PB \cdot PD \cdot QB \cdot QD$

In 1665 he published his arithmetical triangle, a device for determining the coefficients of the expansion $(a + b)^n$. (See PASCAL'S TRIANGLE.) The theory of probabilities (see PROBABILITY) assumed form under the hands of Pascal and Fermat (q.v.). Pascal's last work dealt with a curve called by him the roulette and known later as the cycloid (q.v.).

Bibliography. Recent editions of the *Œuvres* are by P. Faugère, after autograph manuscripts (2 vols., Paris, 1886-95), and Léon Braunschvicg (14 vols., ib., 1904-14). There are modern editions of *Les provinciales* by Lesieur (1867),

Sacy (1877), Soyres (1880), Derôme (1880-86), Brunetière (1896), and others. Of the *Pensées* may be mentioned here the modern editions by Molinier (1877-79), Guthlin (1896), Michaut (1896), and Braunschvicg (3 vols., 1904); also an Eng. trans. by C. Kegan Paul (New York, 1911). With the *Pensées* are usually included the chief minor works, *Entretien avec M. De Sacy*, *Discours sur la condition des grands*, *L'Esprit géométrique*, *Préface d'un traité du vide*, and the Letters to Mademoiselle de Roannez. Both *Les provinciales* and the *Pensées* have been frequently translated. An elaborate edition was prepared by Boutroux in 1903. A full bibliography may be found in Louis Petit de Julleville, *Histoire de la langue et de la littérature française* (8 vols., Paris, 1896-99). Consult also: A. R. Vinet, *Studies on Pascal* (Eng. trans., Edinburgh, 1859); Victor Cousin, *Etudes sur Pascal* (5th ed., Paris, 1857); Dreydorff, *Pascal, sein Leben und seine Kämpfe* (Leipzig, 1870); J. L. F. Bertrand, *Blaise Pascal* (Paris, 1891); Leslie Stephen, *Studies of a Biographer*, vol. ii (New York, 1898); Adolphe Hatzfeld, *Pascal* (Paris, 1901); E. E. M. Boutroux, *Pascal*, Eng. trans. by E. M. Creak (Manchester, Eng., 1902); W. R. Clark, *Pascal and the Port-Royalists* (New York, 1902); W. J. Williams, *Newman, Pascal, Lousy, and the Catholic Church* (London, 1906); Fortunat Strowski, *Pascal et son temps* (3 vols., Paris, 1907-08); C. A. Sainte-Beuve, *Port Royal*, vols. ii-iii (new ed., ib., 1908); P. E. More, *Shelburne Essays, Sixth Series* (New York, 1909); H. R. Jordan, *Blaise Pascal: A Study in Religious Psychology* (London, 1910); St. Cyres, *Pascal* (New York, 1910), containing a bibliography; A. L. Gazier, *Les derniers jours de Blaise Pascal: Etude historique et critique* (Paris, 1911). The best study of his scientific works is Desloves, *Etude sur Pascal et les géomètres contemporains* (ib., 1878); also Albert Maire, *L'Œuvre scientifique de Blaise Pascal: Bibliographie critique et analyse* (ib., 1912).

PASCAL, pás-kál', ERNESTO (1865-). An Italian mathematician, born at Naples, where he was educated. From 1890 to 1908 he served as professor of calculus at the University of Pavia and thereafter was professor of algebra and higher analytics at the University of Naples. His publications include: *Esercizi e note critiche di calcolo infinitesimale* (1895); *Lezioni di calcolo infinitesimale* (1895); *Teoria delle funzioni ellittiche* (1896); *Calcolo delle variazioni* (1897; Ger. trans. by A. Schepp, 1899); *I determinanti* (1897; Ger. trans. by Hermann Leitzmann, 1900); *Repertorio di matematiche superiori* (2 vols., 1898-1900; Ger. trans. by A. Schepp, 2 vols., 1900-02); *I gruppi continui di trasformazioni* (1903).

PASCAL, FRANÇOIS. See GÉRARD, FRANÇOIS PASCAL, BARON.

PASCAL'S THEOREM. See CONCURRENCE AND COLLINEARITY.

PASCAL'S TRIANGLE. A device studied by Pascal (q.v.) for the determination of the coefficients of the expansion $(a + b)^n$, where n is any positive integer. The triangle is constructed in the way shown on page 137. In this triangle every number is equal to the sum of the numbers to the left and immediately above it, the figures in the n th diagonal extending upward from the left to right in the coefficients of the expansion $(a + b)^n$. It first appears in print on the title-page of an arithmetic by Apianus

(1527). It is also mentioned by Chu Chi-chieh, a well-known Chinese algebraist, in his *Sze-yuen Yu-kien* (1303), as an "ancient method." It

1	1	1	1	1	1	.	.
1	2	3	4	5	6	.	.
1	3	6	10	15	21	.	.
1	4	10	20	35	56	.	.
1	5	15	35	70	126	.	.
1	6	21	56	126	252	.	.
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seems to have been long known in China. Johann Scheubel, a German algebraist, also used it a century before Pascal made the device famous.

PASCH, push, MORITZ (1843-). A German mathematician, born in Breslau and educated at the universities of Breslau and Berlin. In 1870 he became privatdocent at the University of Giessen, and was professor from 1873 until his retirement in 1911. His *Vorlesungen über neuere Geometrie* (1882) contained the first important system of axioms for descriptive geometry, and he also wrote. *Einleitung in die Differential- und Integral-Rechnung* (1882), *Grundlagen der Analysis* (1909), with Thaeer, *Veränderliche und Funktion* (1914)

PASCHAL, pás'kal. The name of two popes —**PASCHAL I**, SAINT (Pope, 817-824). The chief general importance of his pontificate lies in his relations with Louis le Débonnaire, who in 817 gave him concessions, the record of which forms the earliest extant document concerning the temporal possessions of the Roman see. In 823 he crowned Louis's son Lothar as Augustus, or co-regent with right of succession to the Empire. His letters are in Migne, *Patrologia Latina*, cii. Consult Simson, *Ludwig der Fromme* (Leipzig, 1874-76), and H. K. Mann, *Lives of the Popes*, vol. ii (London, 1906). —**PASCHAL II** (Pope, 1099-1118), Raniero di Bieda. As a monk of Clugny he came to Rome on business for his order and on account of his usefulness was detained there. Gregory VII made him Cardinal. On his election to the papacy he was opposed by an antipope claiming the title of Clement III, and three others followed before the schism was extinguished. His administration was marked by vehement conflicts with the civil power which concentrated in the question of investiture (q.v.). The Emperors Henry IV and Henry V and King Henry I of England were his principal opponents, Philip I of France was also excommunicated for his illegal union with the wife of Fulk of Anjou, but finally submitted and was reconciled. Consult E. Franz, *Papst Paschalis II* (Breslau, 1877), and B. Monod, *Essai sur la rapport de Paschal II avec Philippe I* (Paris, 1907).

The name of Paschal was also borne by two antipopes. One opposed Sergius I from 684, but in 687 was deposed and shut up in a cloister, where he died in 692. The other, who took the title of Paschal III, was set up in 1164 by the faction of Frederick Barbarossa and died in 1168. He is chiefly remembered for having canonized Charlemagne at the instance of Fred-

erick, but this action was not ratified by the Church.

PASCHAL CHRONICLE (Lat. *Chronicum Paschale*). A chronicle compiled in part from the Paschal canons (rules for the Easter festival) of various districts and towns and containing a summary of events in chronological order from Adam to 629 A.D., which was the twentieth year of Heraclius. It was at one time named also *Chronicum Alexandrinum*, because then attributed to a writer of Alexandria. The name of the author, however, is not known. It at first extended, according to the opinion of some, only to 354 A.D., in the reign of Constantius, the continuation of it with additions to the first part being the work of a later compiler. Others, however, regard it all as the work of one man. The manuscript in which it now exists (in the Vatican) is Byzantine work of the eleventh century. It is sometimes called also *Fasti Siculi*, because it was found in an old library in Sicily, from which it was taken to Rome. Notwithstanding its numerous faults, both of matter and style, it contains much valuable chronological information. There is a convenient edition in two volumes (Bonn, 1832). Consult J. van der Hagen, *Observationes in Heraclii Imperatoris Methodum Paschalem* (Amsterdam, 1736), and C. Krumbacher, *Geschichte der byzantinischen Literatur* (2d ed., Munich, 1897).

PASCHASIUS (päs-kä'si-üs) **RADBERTUS** (786-c.860). A theological writer of the Carolingian age. He was born near or in Soissons. In 814 he joined the monastery of Corbie, of which he was subsequently elected abbot. He was a member of the Synod of Paris and took part in the Assembly of Chiersy in 849. Two years afterward he resigned his position as abbot and devoted himself entirely to literary work. The most important of his writings are *De Corpore et Sanguine Domini*, which caused a prolonged controversy on the doctrine of the Lord's Supper, *Expositio in Lamentationes Jeremiae*, *De Fide, Spe et Caritate*; *De Partu Virginis*, in which he defended the virginity of Mary, the mother of Jesus. His works were published collectively at Paris in 1618 under the editorship of Sirmond.

PASCO, pä'skô, CERRO DE. A city of Peru. See CERRO DE PASCO.

PAS-DE-CALAIS, pä-de-kä'lä' (Fr. for Strait of Dover). A department in the north of France, embracing most of the old Province of Artois and part of Picardy (Map: France, N., H 2). Area, 2606 square miles. Pop., 1901, 955,391; 1911, 1,068,155. The surface is level, with the exception of a ridge of hills running from the southeast to the northwest, ending in (Gris-Nez Cape (qv) and forming the watershed between the North Sea and the English Channel. The highest point (695 feet) is reached a little to the southwest of Desvres. The 80 miles of coast, save at Boulogne, is sandy. The rivers, which are of no considerable length, are the Aa, Scarpe, and Lys, in the basin of the North Sea, and the Authie and Canche, belonging to the basin of the English Channel. The rivers are navigable within the department and are connected by canals. The climate is mild, but variable, and the fertile soil produces cereals, vegetables, and tobacco in abundance. Fishing is actively carried on, particularly in the neighborhood of Boulogne. The coal fields which lie about Bethune are the most important in France. Excellent stone is quarried and

considerable quantities of peat are cut. The industrial establishments are numerous and important, including iron and metal foundries, glass works, potteries, tanneries, bleach works, and textile mills for linen and lace. Capital, Arras. Boulogne and Calais are the principal ports. In the European War which broke out in 1914 the Germans made several attempts to capture these ports in order to control the English Channel. See **WAR IN EUROPE**.

PASDELOUP, pâ'd'-lô', JULES ETIENNE (1819-87). A French musical conductor, born in Paris. At 10 years of age he entered the Paris Conservatoire and in 1834 won the first prize for his piano playing. He held a government position after 1848, but three years later began the formation of an orchestra composed of Conservatory students, whom he trained to produce the symphonies of the best French and foreign composers. This was the beginning of the concerts populaires, which from their foundation in 1861 truly merited their name. The Legion of Honor and other marks of distinction were conferred on him, and his Sunday concerts were subsidized by the government and were carried on for more than 20 years. Padeloup managed the Lyric Theatre (1868-70) and was an instructor at the Conservatoire in 1847-50 and again in 1855-68.

PASEWALK, pil'ze-vâlk. A town of Pomerania, Prussia, on the Ucker, 22 miles west-northwest of Stettin (Map: Germany, F 2). It contains several churches and a bronze statue of Frederick III erected in 1895. The manufactures include tobacco, starch, flour, oil, and plaster, and there are iron foundries, flour and saw mills. Pop., 1900, 10,299; 1910, 10,916.

PASHA, pâ-shâ', or **BASHA**. A title used in the Ottoman Empire. The derivation of the term is uncertain. It has been connected with the Turkish *bash*, head, chief; with the Persian *padshah* from *pad*, protector, and *shah*, king, or *pa*, foot, and *shah*; or with the Aramaic *pacha*, Hebrew *pecha*, Assyrian *pacatu*, governor. It is bestowed upon high civil and military officers. Of the latter there are three grades, symbolized by the number of horsetails formerly borne before them on occasions of state. Three tails signify general in chief; two tails, general; and one, brigadier. The actual symbols, which are of Mongolian origin, were abolished by Mahmud II (1808-39), but the grades still exist. Admirals also have the title pasha. Civil officers of the rank of vizier, provincial governors, and others also receive the title. It has been bestowed on Christians as well as on Moslems. The province governed by a pasha is known as a pashalik or vilayet. The authority of the pasha in his province was formerly absolute, but he is now held in check by local councils, and the Sultan may at any moment remove the pasha and even put him to death. See **BASHI**.

PASHICH, pâ'shîch, NICOLA (1846-). A Serbian statesman, born in Saïchar (Zaychar). He was educated at Belgrade and in the Zurich Polytechnicum and from 1872 to 1875 was in the Serbian service as an engineer. He fought in the war with Turkey in 1876-78. After practicing engineering for a few years he became a member of the Skupshtina in 1878 and one of the leaders of the Radical party in 1881. For a plot against King Milan he was sentenced to death, and lived in exile from 1883 to 1889, when he was amnestied. Immediately after his return he became president of the

Skupshtina and mayor of Belgrade and in 1891-92 Premier. In 1893-94 he was Ambassador to Russia. Condemned to five years' imprisonment in 1899 for complicity in another attempt on the King, he was immediately pardoned, apparently because of Russia's intervention. In 1904 he was Minister of Foreign Affairs and from December, 1904, to May of the next year, and from April, 1906, to June, 1908, was Premier. He held the reins, actually though not nominally, in 1909 in the Austrian crisis. In September, 1912, he again became Premier. The following June he offered his resignation because his moderate policy with Bulgaria was unpopular, but the King kept him in power and he was in charge during the Austrian crisis of 1914.

PASHIUBA (pâ'shê-ô'bâ) **PALM**. See **IRIARTEA**.

PASHKOV, pâsh'kôv, VASIL ALEXANDROVITCH (?-1902). A Russian religious reformer, founder of an evangelical sect, called after him the *Pashkovtsy*. An officer of the Imperial Guard and with high connections, he was brought to accept Lord Radstock's views of primitive Christianity (1874), founded an association for the encouragement of religious reading (1876), which was abolished about 10 years later, and did a simple and unassuming evangelical work in which he met with great success, especially among his own class. He spent almost his entire fortune in wise charity. During the reign of Alexander II, a ruler with whom Pashkov was on terms of intimacy, the work was uninterrupted. In 1884, however, he was forced into exile, first from St. Petersburg and then from the whole of Russia, the immediate occasion being his attempt to unite the Stundists and Baptists of the south with his own northern sect by means of a simple creed. He afterward lived in Austria, England, and France. The earnestness and directness of his appeal were such that his religious enemies, of which he had many among all denominations, feared his influence with the masses. None, not even Tolstoy, his contemporary religious reformer, ever had such a large following as this unassuming preacher of a universal gospel which appeals to the heart rather than to the mind. For a brief but appreciative study of his life and work, consult the *Eclectic Magazine*, vol. cxxxix, 3d series, pp. 344-350.

PASHTU, pûsh'tôo, or **PUSHTU**, pûosh'tôo. See **AFGHAN**.

PASIG, pâ'sêg. The outlet of the Laguna de Bay, in Luzon, Philippine Islands. See **MANILA**.

PASIG. The capital of the Province of Rizal, in central Luzon, Philippines (Map: Philippine Islands, C 3). It is near the northwest corner of the Laguna de Bay, 8 miles east of Manila. The city was burned during the insurrection of 1897, and only a few well-built stone houses remain, the majority of the people living in bamboo or nipa huts. It has a fort and manufactures pottery. Pop., 1903, 11,287.

PASINI, pâ-zê'nê, ALBERTO (1826-99). An Italian landscape and figure painter, born at Busseto, near Parma. He studied at the Parma Academy and in 1851 went to Paris, where he was assistant to Cicéri and at first practiced lithography. In 1855 he accompanied Bourrée to Persia. Subsequently he traveled widely in the East and became the foremost Italian Oriental painter of the nineteenth century. His Spanish and Venetian scenes are scarcely less charming than his Eastern pictures, which are

full of atmosphere, clear in color, and minutely finished. Pasini was awarded the medal of honor at Paris in 1878. Excellent examples of his work are in the Metropolitan Museum, New York, and the galleries at Rome, Turin, Florence, and Parma.

PASIPHAE, pā-sī'fā-ē (Lat., from Gk. Πασιφάη). In Greek mythology, the daughter of Helios and sister of Circe. She was the wife of Minos, but, in consequence of his neglect to perform a certain vow, Poseidon rendered her enamored of a bull and she became the mother of the Minotaur. See MINOS; MINOTAUR.

PASITHÆA (Lat., from Gk. Πασιθέα). The wife of Hypnos, and one of the Graces.

PASKEVICH, pās-kā'vich, IVAN FEODOBOVITCH, COUNT OF ERIVAN, PRINCE OF WARSAW (1782-1856). A Russian field marshal, born at Poltava. He belonged to a Polish family, was a page of the Emperor Paul, and, entering the army in 1800, served in the campaign of Austerlitz. He fought subsequently against the Turks. He was also actively engaged in the campaign of 1812, was present at the battle of Leipzig in 1813, and participated in the conflicts under the walls of Paris. In 1826 he gained a great victory over the Persians under Abbas Mirza at Yelizavetpol and in the following year conquered Persian Armenia and captured Erivan. He obtained for Russia the advantageous Peace of Turkmanchai (1828). For these services he was created Count of Erivan. In 1828 and 1829 he made two campaigns against the Turks in Asia, taking Kars, Erzerum, and other important places. In 1831 Paskevich, now a field marshal, succeeded Diebitsch as commander of the Russian forces in Poland; he put an end to the revolt within three months after his appointment, taking Warsaw after a desperate resistance, Sept. 8, 1831. He was made Governor-General of Poland, and such was the vigor and severity of his rule that the eventful year of 1848 passed without any attempt at revolution. When Russian intervention in Hungary had been resolved upon in 1849, Paskevich marched into that country at the head of 200,000 men. The Hungarian main army, unable to make head against the double foe, laid down its arms at Világos, August 13. In 1854 Paskevich took the command of the Russian army on the Danube, but after an unsuccessful siege of Silistria he resigned his command and retired to Warsaw, where he died, Feb. 13, 1856. Consult Tolstoy, *Essai biographique et historique sur le Field-marshal Prince de Varsovie* (Paris, 1885).

PASLEY, SIR CHARLES WILLIAM (1780-1861). A British soldier and military engineer, born at Eskdale Muir, Dumfriesshire. He entered the Royal Military Academy at Woolwich in 1796, received a commission in the Royal Artillery in the following year, and in 1798 was transferred to the Royal Engineers. Between 1799 and 1810 he served in Minorca, Malta, Naples, and Sicily, at the siege of Copenhagen (1807), under Sir John Moore in Spain, and in Holland. Pasley was regularly promoted, becoming general in 1860. He did much to promote military engineering by his writings, which include: *Essay on the Military Policy and Institutions of the British Empire* (1810, 5th ed., 1914), *Military Instruction* (3 vols., 1814-17, 2d ed., 1822), *Practical Operations of a Siege* (2 vols., 1829-32).

PASPALUM (Neo-Lat., from Gk. πάσπαλος, *paspalos*, sort of millet, from *pās*, *pas*, all +

πάλη, *palē*, meal). A genus of numerous species of grasses, mostly natives of warm climates, with solitary or variously grouped spikes, one-flowered spikelets, and awnless paleae. *Paspalum scrobiculatum*, the cereal koda, cultivated in India, grows in dry loose soils. *Paspalum exile* is called fundi (see FUNDI) or fundungi in west Africa, where it is similarly cultivated. *Paspalum racemosum* is a very important fodder grass in the coast districts of Peru during the dry months of February and March. It has been introduced into France, but it is apt to be injured by frosts, and seldom ripens its seeds in the neighborhood of Paris. Several perennial species are indigenous in the southern United States, where they are highly appreciated as fodder and pasture grass. They have some of the characteristics of Bermuda grass (q.v.). *Paspalum compressum* (*Anastrophus compressus* or *Paspalum platycaule* of some botanists), commonly known as Louisiana grass or carpet grass, is considered an excellent lawn grass for the Southern States, being superior to Bermuda and less difficult to eradicate.

PASQUE (pâsk) **FLOWER** (OF. *pasque*, Fr. *pâque*, Easter, from Lat. *pascha*, Gk. πάσχα, Easter, from Heb. *pesach*, a passing over, Passover, from *pāsach*, to pass over), *Anemone*. A genus of perennial silky herbs of the family Ranunculaceae, by some botanists separated into the genus *Pulsatilla*, the chief distinguishing characteristic being the long feathery awns of the fruit. The common pasque flower (*Anemone pulsatilla*) is a native of Europe, with widely bell-shaped bluish-purple flowers, the petals of which are often used to color Easter eggs. *Anemone pratensis* has smaller and more perfectly bell-shaped blackish-purple flowers. These plants emit, when bruised, a pungent smell, due to an essential oil. *Anemone patens* is acrid and is said to blister the skin occasionally. *Anemone patens wolfgangiana*, also known as *Pulsatilla hirsutissima*, the American pasque flower, occurs abundantly from Illinois northward and westward. See ANEMONE.



PASQUE FLOWER
(*Anemone pulsatilla*).

PASQUIER, DUC D'AUDIFFRET. See AUDIFFRET-PASQUIER, E. A. G., DUC DE

PASQUIER, pā'skyā', ETIENNE (1529-1615). A French jurist and author. He early studied law under the ablest jurists of France and Italy and in 1549 was called to the bar. Having already secured a considerable practice, he in 1560 published the first part of his *Recherches de la France*, an antiquarian treatise on national politics, literature, and religion, written in French—an audacious innovation, since at that time scientific works were still written in Latin. In

1565 he made his celebrated speech defending the University of Paris from the encroachments of the Jesuits. He was in 1585 appointed by Henry III advocate-general of the Court of Accounts and followed the King on his retreat to the Loire, returning to Paris in 1594 with King Henry IV. Pasquier worked in wide and varied fields—poetry, fiction, law, history. From 1586 to 1619 appeared his celebrated *Lettres*, his correspondence with the scientific men of Europe.

PASQUIER, MADAME. See PASCA, ALIX.

PASQUINADE. See PASQUINO.

PASQUINI, pás-kwé'né, BERNARDO (1637–1710). An Italian organist and composer, born at Massa di Valnevola (Tuscany). For many years he was organist at Santa Maria Maggiore in Rome, enjoying the reputation of being a master of his instrument. His toccatas and suites for the harpsichord occupy a prominent place in the history of piano music, as they exerted considerable influence in the development of the sonata form. He also wrote 10 operas and eight oratorios. He died in Rome.

PASQUINO, pás-kwé'nó. The name given in Rome to a mutilated antique statue discovered in Rome in 1501 and erected in the Piazza Navona, near the Palazzo Braschi. From the beginning of the sixteenth century it was customary to affix to the statue epigrams on current events, frequently in the form of questions and answers passing between Pasquino and another statue known as Marforio (this statue was dug up in the Campus Martius, and so came a *Martis foro*). These epigrams were called pasquinades. The name is said to have been taken from a witty tailor of the end of the fifteenth century, who was renowned for his pungent criticisms of public men. The Roman populace, when the government checked its freedom of speech, found the use of these statues described above an outlet for its opinions; but since Marforio was transferred to the Capitoline Museum, Pasquino has not had much to say. The Italian pasquinades were in verse, usually Latin, though occasionally Greek. Pasquinades were written too in French in verse and in English in prose. Sir Thomas Elyot wrote a satire called *Pasquin the Plain* (1540), and Thomas Nash in his controversial pamphlets called himself "Pasquil of England."

PASSACAGLIA, pás-sá-kü'lyá. Originally an old Italian or Spanish dance form in $\frac{3}{4}$ time. During the eighteenth century composers for the piano introduced it into the suite, while organists wrote independent passacaglias for their instrument. Its chief characteristic is a short four or eight bar theme used throughout as a cantus firmus, which may appear in any of the voices, whereas in the chaconne (q.v.), a form almost identical with the passacaglia, the theme is constantly kept in the bass as an ostinato (q.v.). In modern times Brahms has revived the form in the finale of his fourth symphony.

PASSAGE (OF, Fr. *passage*, from ML. *passaticum*, right of passage, from *passare*, to pass, to step, from Lat. *passus*, pace). In music, a term applied to a rapidly executed ornamental figure which is not essential to the melodic outline. In concertos for solo instruments it is customary to give the performer an opportunity to display his mastery of mere technical skill. In the finale, just before the end, the composer indicates such a place by placing the word *ca-*

denza there. Such a cadenza has really nothing to do with the composition and consists of an extensive series of rapid ornamentations without any accompaniment. This is called *passage* work.

PASSAGLIA, pá-sü'lyá, CARLO (1812–87). An Italian theologian. He was born near Lucca, became a Jesuit in 1827, and in 1844 was appointed professor of canon law, and in 1845 of dogmatic theology, in the Collegium Romanum. During the temporary withdrawal of the Jesuits from Rome in 1848–51 Passaglia, with some of his brethren, went to England, where he taught theology to the young brethren of his order, and on the reestablishment of the Jesuits in the Roman College he resumed possession of his chair. During the discussions which preceded the definition of the doctrine of the Immaculate Conception (q.v.) he published an elaborate treatise on the doctrine and history of that question (1853). Becoming interested in the movement for Italian unity in 1859, he left the Society of the Jesuits, and attacked the temporal power of the Pope. Having fallen under suspicion in Rome, he withdrew from that city to Turin, where he established a journal entitled *Il Mediatore*, which appeared till 1866. In 1861 he was appointed by the King professor of moral philosophy, and subsequently of theology, in the University of Turin. In 1863 he became a member of the Turin Parliament. He is said to have sought reconciliation with the Church, but to have failed to make the required retraction. He died in Turin, March 12, 1887. Passaglia's principal works are the treatise on the Immaculate Conception already referred to; a treatise (Latin) on the primacy of St. Peter (1850); a scholastic treatise entitled *Commentarius Theologicus de Partitione Divinae Voluntatis* (1851); an apology for the cause of Italian unity, entitled *Pro Causa Italica; ad Episcopos Catholicos* (1861), in which he attacked the temporal power of the Pope and recommended the Church to make peace with the nation; several essays on religious and political subjects, and a reply to Renan's *Vie de Jésus* (1864). Consult his *Life* by Biginelli (Turin, 1887).

PASSAIC. A city in Passaic Co., N. J., 13 miles northwest of New York City and 4 miles south by east of Paterson, at the head of navigation on the Passaic River, and on the Erie, the New York, Susquehanna, and Western, and the Lackawanna railroads (Map: New Jersey, D 2). It has many paved and well-kept streets, lined with shade trees, a fine residential section, an excellent sewer system, and a park. There are 11 grade schools and a splendid high school, besides a number of private and parochial schools. The city has an adequate public library, housed in a handsome building, and among other noteworthy features are the two hospitals, a municipal building, another library, and the city hall. Passaic is extensively engaged in manufacturing, having good water power and excellent railroad facilities. The industrial establishments include large wool and textile mills, handkerchief factories, print and chemical works, rubber mills, metal works, tanneries, silk and belting mills, packing plants, etc. The output of these in 1909 was valued at \$41,729,000, representing an invested capital of \$42,841,000 and giving employment to 16,386 persons. Passaic spent in 1913 on maintenance and operation \$668,783, the chief items of expenditure being \$49,000 for the police department, \$65,000 for

the fire department, and \$339,000 for education. Pop., 1890, 13,028; 1900, 27,777; 1910, 54,773; 1915 (State census), 61,250.

Settled about 1676 and organized as a township in 1693, Passaic was incorporated as a village in 1869 and chartered as a city in 1875. Until about 1852 it was known as Aquackanonk Landing. The commission form of government was adopted in 1911. In November, 1776, Washington, retreating through New Jersey, crossed the Passaic at this point. Consult Pape and Scott, *News History of Passaic, from the Earliest Times to the Present Day* (Passaic, 1899).

PASSAIC RIVER. A river of northern New Jersey (Map: New Jersey, D 2). It rises a few miles southwest of Morristown, flows in a devious course northeastward to Paterson, then bends abruptly to the south, and flows into Newark Bay between Newark and Jersey City. It is about 100 miles long, and navigable for about 11 miles to Passaic. At Paterson it has a perpendicular fall of 50 feet, which furnishes immense water power.

PAS'SAMAQUOD'DY (perhaps, pollock catcher). A small Algonquian tribe, closely related to the Malecite and less intimately to the Abnaki proper, and formerly residing about Passamaquoddy Bay and St. Croix River, in Maine and New Brunswick. In customs they resembled the Abnaki, and, like them, acted with the French in the Colonial wars. They are now gathered, to the number of 380, at Pleasant Point and on Lewis Island, on the bay of their name. Consult Prince in *Proceedings of American Philosophical Society*, xxxvi (Philadelphia, 1897).

PASSAMAQUODDY BAY. An inlet of the Bay of Fundy, forming part of the boundary between Maine and New Brunswick (Map: Maine, E 3). It is 12 miles long by 6 wide and shut in by a cluster of islands so as to form an excellent harbor. It receives the St. Croix and other rivers. The city of Eastport, Me., lies on Moose Island, and at the head of the bay is the town of St. Andrews, New Brunswick.

PASSANT, pa'sin' (Fr., passing). An heraldic term used to express the attitude of an animal in a walking position, with his head straight before him. See HERALDRY.

PASSAROWITZ. See POZAREVATZ.

PASSAU, pas'ou. An ancient episcopal town of Bavaria, Germany, situated at the confluence of the Danube, the Inn, and the Ilz, on the Austrian frontier and 90 miles east-northeast of Munich (Map: Germany, E 4). The town proper is situated on the rocky tongue between the Danube and the Inn and is remarkably picturesque with its old-fashioned houses rising in terraces. The two suburbs of Innstadt and Ilzstadt are situated on the Inn and the Ilz respectively. Opposite Ilzstadt stands the old fortress of Oberhaus, dating from the beginning of the thirteenth century. The centre of the old town is the Domplatz, with the beautiful cathedral of St. Stephen, founded in the fourteenth century and rebuilt in the rococo style in the seventeenth century. Adjoining the cathedral is the post office, formerly the canons' residence, where the Treaty of Passau (q.v.) was concluded in 1552. Worthy of mention are also the old and the new rococo episcopal residences and the Rathaus. At Innstadt is situated the pilgrimage church of Mariahilf. The educational institutions include the Royal Bavarian Lyceum with faculties of theology and philosophy, a Real-

schule, a school of agriculture, a training school for teachers, a number of institutes for girls, and a library. The important manufactures are leather, porcelain, and cabinetwork. The city trades in paper, mirrors, matches, wire, and machinery, and does a good river business in wood, salt, and grain. Pop., 1900, 17,988; 1910, 20,983, chiefly Roman Catholics.

Passau proper occupies the site of the Castra Batava of the Romans, and Innstadt is identified with the Celtic settlement of Boiudurum, founded about 100 B.C. The bishopric of Passau, of which the town is the seat, was founded in 738, secularized in 1803, and reestablished in 1817.

PASSAU, TREATY OF. An agreement made in the year 1552 at Passau by the Elector Maurice of Saxony and Ferdinand, King of the Romans, representing his brother, the Emperor Charles V. It was signed by Maurice on August 2 and agreed to by the Emperor a few weeks later. It established peace between the Catholics and Lutherans pending the settlement of ecclesiastical matters by the next Diet, thus guaranteeing the free exercise of their religion to the adherents of the Confession of Augsburg in the states which had adopted this form of worship. A definitive settlement was effected at the Diet of Augsburg in 1555. Consult: Barge, *Die Verhandlungen zu Linz und Passau und der Vertrag von Passau* (Strassburg, 1893). Walther Kühne, *Geschichte des Passauer Vertrags 1552* (Göttingen, 1906); Gerhard Bonivetsch, *Geschichte des passauischen Vertrags von 1552* (ib., 1907). See REFORMATION, THE PROTESTANT.

PASSAVANT, pa'sa'vân', JOHANN DAVID (1787-1861). A German art critic and painter, born at Frankfurt-on-the-Main. He studied painting with David and Gros at Paris and afterward with the Nazarenes in Rome. His paintings are unimportant, but he eventually became inspector of the Städel Institute at Frankfurt and did much to promote art by virtue of his position and also by his literary works. The principal of these are *Rafael von Urbino und sein Vater Giovanni Santi* (1839-58) and *Le peintre-graveur* (6 vols., 1860-64), an appendix to Bartsch's standard work on the same subject. He had a fine appreciation of art, but his works, though scholarly and critical in their day, have been superseded. Consult his autobiography (Frankfurt, 1863) and the biography by Cornill (ib., 1865).

PASSAVANT, WILLIAM ALFRED (1821-94). An American philanthropist, born at Zelenople, Butler Co., Pa. He graduated at Jefferson College in 1840 and at the Lutheran Theological Seminary, Gettysburg, in 1842, was pastor of churches at Baltimore and Pittsburgh, and subsequently became widely known as the founder of hospitals and orphan asylums at various places in the United States. In 1870 he, with A. Louis Thiel, founded Thiel College, at Greenville, Pa. He introduced the Kaiserwerth system of deaconesses into the United States. From 1848 to 1861 he edited the *Missionary*, and subsequently was coeditor of the *Lutheran and Missionary*. Consult G. H. Gerberding, *Life and Letters of W. A. Passavant* (Greenville, Pa., 1906).

PASS CHRISTIAN. A town in Harrison Co., Miss., 58 miles east-northeast of New Orleans, on Mississippi Sound (Gulf of Mexico) and on the Louisville and Nashville Railroad (Map: Mississippi, G 10). It is one of the most

popular watering places on the Gulf, having a healthful climate and excellent facilities for boating, bathing, and fishing. Among its attractions is a wide shell-paved avenue lined with fine trees. It extends for 7 miles along the shore, where there are many pleasure piers. Pass Christian is the centre of an important oyster industry and is in a farming, grazing, and trucking district. It also has a large packing establishment. Pop., 1900, 2028; 1910, 2458.

PASSÉ, pá'sá'. A tribe of the great Arakan stock (q.v.), formerly the most numerous tribe on the Japura River, northwestern Brazil, but now nearly extinct. Both men and women are noted for their light complexion, fine figures, and handsome features, approaching the Caucasian type. They are clean in habit, intelligent, gentle, and industrious, and have been called the noblest tribe of the Amazon region. They tattoo their faces; the men cut the hair close, while the women wear it flowing loosely. They bury their dead in circular graves and are greatly under the influence of their priests.

PASSEMENT, pás'ment. See LACE.

PASSENGER PIGEON. The American wild or migratory pigeon. See PIGEON; also Plate of PIGEONS.

PASSENGERS. See CARRIER, COMMON.

PASSEPIED, pás'pyá' (from Fr. *passer*, to pass, from Lat. *passus*, step, from *pandere*, to stretch + *ped*, foot, from Lat. *pes*, foot). An old French dance in $\frac{3}{4}$ or $\frac{4}{4}$ time. It resembled the minuet, but was a little more lively. During the time of Louis XIV it was introduced into the ballet and was also often inserted in suites. It was divided into a number of parts of 8 or 16 bars each.

PASSERAT, pás'rä', JEAN (1534-1602). A French poet and scholar, born at Troyes. He taught in various Provençal colleges until 1569, when he gained the patronage of Henri de Mesnes and settled in Paris. In 1572 he succeeded Ramus as professor of eloquence and Latin poetry at the Collège de France, where his learning and wit brought him many pupils. But Passerat was a patriot, and during the Wars of the League he had to suspend his courses. At this time he was one of the authors of the *Satire Ménippée* (1594), which was his chief literary achievement. The grace, point, and erudition of his verse make him one of the most interesting of the post-Pléiades. His works include: *Vers de chasse et d'amour* (1597); *Kalendaræ Januariæ et Varia quædam Poemata* (1597), and commentaries on Tibullus, Catullus, and other Roman poets. His collected works were edited by Blanchemain in 1881 (Paris).

PASSERES, pás'sér-éz (Lat., sparrows), or **PASSERIFORMES.** The largest order of birds, nearly corresponding to the old order Insectores or perchers. The order takes its name from a typical genus (*Passer*) represented by the common house sparrow (q.v.). The Passeres are characterized by the possession of four toes, three in front and one behind, all inserted on the same level. The muscle that bends the hind toe is separate from the muscle which bends the other toes collectively; there is no ambiens, and no accessory femorocaudal muscle; the sternum has a single notch on each side behind; there are more than six secondaries and the rectrices are almost always 12; the palate is ægithognathous; there is a single carotid, the left; the oil gland is nude; there are two cæca; the upper cervical

feather tract is directly continuous with the dorsal tract, and the femoral tracts are weak; the young are hatched naked and helpless. More than half of all known birds are Passeres. They are found everywhere, and their habits, colors, food, songs, eggs, etc., show the greatest diversity. According to the structure of the syrinx, they are grouped as Clamatores (Passeres anisomyodæ), or as Oscines (Passeres diacromyodæ). Sharpe estimates in the order Passeriformes 61 families, 1488 genera, and 11,558 species and subspecies. Consult A. H. Evans, *Birds* (London, 1900).

PASSI, pás'st. A town of Panay, Philippines, in the eastern part of the Province of Iloilo, situated 24 miles north of Iloilo. Pop., 1903, 7578.

PASSING NOTES. See HARMONY.

PASSINI, pá-sé'né, LUDWIG (1832-1903). An Austrian water-color painter, born in Vienna. He was a son and pupil of the engraver Johann Passini (1798-1874), studied at the Vienna Academy under Führich and Kupelwieser, and finally devoted himself to painting in water colors under Karl Werner, with whom he traveled in Italy. After living in Rome and Berlin he settled in Venice, the artistic beauties of which he was the first painter to discover. Thenceforth he devoted his brush chiefly to those delicately fresh and natural delineations of Venetian life with which his name is associated as one of the most distinguished aquarellists of his day. Prominent examples of his work are: "Canons in St. Peter's, Rome" (1870, National Gallery, Berlin); "The Tasso Reader" (1872); "Pumpkin Venders in Venice" (1876, Vienna Museum); "Curious People on a Bridge" (1885, Breslau Museum); "Mass at Chioggia" (Metropolitan Museum, New York). Passini also painted excellent portraits.

PASSION, or PASSION MUSIC. From the earliest times it was customary in the Church to chant the story of the passion of Christ during Holy Week. As a musical art form the passion first appears in Germany about 1570. A little later Italy originated the form of the oratorio, and for the next half century no marked distinction appears between the two forms. Then the passion began to assume characteristic traits which distinguish it from the oratorio. These traits are the frequent introduction of chorales, the retention of the character of the "narrator" (which entirely disappeared from the oratorio), and the use of the chorus for contemplation and reflection upon the events related. See ORATORIO; SACRED MUSIC.

PASSIONATE PILGRIM, THE. A small collection of sonnets and lyrics by Shakespeare, Marlowe, Barnfield, and Raleigh, published by W. Jaggard in 1599. Shakespeare's name appeared on the title-page, but was evidently unauthorized, as it was dropped in later editions, and several of the poems were erroneously attributed to him.

PASSION CROSS (Lat. *passio*, suffering, from *pati*, to suffer). A cross supposed to reproduce the form and proportions of that on which Christ suffered, with a long upright and one or two short traverses near the top. It often bears the figure of Christ and is heavier in proportions than the resurrection cross, which also belongs to the type of the Latin cross. A passion cross, when elevated on three steps or degrees (said by heralds to represent the virtues of faith, hope, and charity), is called a cross Calvary.

PASSION-FLOWERS



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- 1 PURPLE-FRUITED PASSION-FLOWER - PASSIFLORA EDULIS
- 2 SLENDER PASSION-FLOWER - PASSIFLORA GRACILIS
- 3 COMMON PASSION-FLOWER - PASSIFLORA CARULEA

- 4 MAY-POP - PASSIFLORA INCARNATA
- 5 GRANADILLA - PASSIFLORA QUADRANGULARIS
- 6 PRINCESS CHARLOTTE'S PASSION-FLOWER - PASSIFLORA RACEMOSA.

PASSION FLOWER (*Passiflora*). A genus of about 300 species of mostly climbing plants of the family Passifloraceæ. The species, which are mostly natives of the warm parts of America, have alternate, simple, variously lobed leaves, from the axils of which tendrils are produced. The flowers are usually hermaphrodite, with generally a five-parted, fringed calyx and similarly segmented corolla. Several rows of filamentous processes spring from within the cup, which is formed by the consolidated calyx and corolla. The genus received its name from fanciful persons among the first Spanish settlers in America who imagined a representation of the Lord's passion, the filamentous processes being taken to represent the crown of thorns, the three styles the nails of the cross, and the five anthers the marks of the wounds. On account of the large and beautiful flowers, many of the species are cultivated in greenhouses; some are also grown in tropical countries for their fruit, particularly *Passiflora edulis*. *Passiflora foetida*, *Passiflora coccinea*, and *Passiflora lauriflora* are known as granadillas (see GRANADILLA). *Passiflora quadrangularis* is a larger edible species, called the large granadilla. One of the best-known species is *Passiflora carulea*, a native of Peru and Brazil, extensively grown for its beautiful white, pale-blue, or rose-colored flowers. Like most species, it succeeds in the open only in tropical and subtropical climates. Among the popular cultivated species are *Passiflora gracilis* and *Passiflora racemosa*. About a dozen species are natives of the United States, among which are *Passiflora incarnata*, the Maypop of the Southern States, a showy-flowered edible-fruited species. *Passiflora lutea* has greenish-yellow flowers and smaller fruits. The passion flower is propagated by seeds and by cuttings of the young wood.

PASSIONISTS. The name generally applied to the order whose full name is the Congregation of Discalced Clerks of the Holy Cross and Passion of Our Lord Jesus Christ, founded by St. Paul of the Cross (q.v.), who obtained permission of Benedict XIII to found a congregation in 1725. Their first permanent settlement was made on Monte Argentaro, near Genoa, in 1737; they received the first papal approbation as a society of mission preachers from Benedict XIV in 1741, and their rule, modified in some points, was again confirmed by Clement XIV in 1760, who four years later gave them the church of Saints John and Paul on the Cœlian Hill in Rome, now the headquarters of the order. The members take, besides the usual monastic vows, a fourth to remember and meditate continually upon the sufferings of Christ. Their work is principally the conversion of sinners, especially by preaching missions and retreats. Their habit is black, with a white heart-shaped piece of stuff sewed on the left breast, in which are represented the instruments of the passion—cross, nails, crown of thorns, etc. The general (*præpositus*) is elected by the general chapter for six years; each house has a rector, chosen for three years. The order has now 12 provinces and about 1400 members. In 1915 there were two provinces in the United States (to which they came in 1852), with about 200 professed priests and students.

PASSION PLAY. Plays representing the passion of Christ became numerous between the thirteenth and the sixteenth centuries, especially in Germany and the Tirol. The only survival is that which takes place every tenth year

in the village of Oberammergau in the Bavarian highlands. In 1633, as an act of gratitude for the cessation of the Black Death, which had desolated the surrounding country, the villagers vowed to represent the passion of Christ every 10 years and have ever since observed their vow. The inhabitants of this secluded spot, long noted for their skill in carving wood and ivory, have a rare union of artistic cultivation with perfect simplicity. The personator of Christ considers his part an act of religious devotion; he and the other principal performers are said to be selected for their holy life and consecrated to their work with prayer. The players, about 600 in number, are all villagers, who, though they have no artistic instruction except from the parish priest, act their parts with much dramatic power and a delicate appreciation of character. The Gospel narrative is closely followed; the acts alternate with tableaux from the Old Testament and choral odes. The oldest text in existence was written about 1600, and that now used was revised about the beginning of the last century. It was published in Munich in 1910, and an English translation was made by E. Childe (London, 1880). Consult: Grein, *Das Oberammergauer Passionspiel* (Leipzig, 1880); Stead, *The Passion Play* (London, 1890); E. H. Day, *Ober-Ammergau and the Passion Play* (Milwaukee, 1900); J. H. Short, *Ober-Ammergau* (New York, 1910); H. Diemer, *Oberammergau and its Passion Play* (London, 1910). See MYSTERY.

PASSOVER (trans. of Heb. *pesach*, a passing over, from *päsach*, to pass over). The first of the three chief festivals prescribed in the Pentateuch (Ex. xii; Lev. xxiii. 4-8; Num. ix. 1-14, xxviii. 16-25; Deut. xvi. 1-8). Its celebration begins on the evening of the fourteenth day of Nisan (corresponding to the older Abib) and lasts for eight days. The Jews associate the festival with the Exodus from Egypt, and this historical character was so impressed upon it as to obscure its original significance. Two festivals seem to have been combined in the Passover, viz., (1) a feast of unleavened bread known as *Masgôth*, and (2) a festival in which the chief rite was the sacrifice of a sheep within the family circle and the sprinkling of the lintels and doorposts of the houses with the blood. This sacrifice was called *pesach*. Of these two festivals the former is the old Canaanitish harvest festival, commemorative of the first ripening of the corn, which the Hebrews naturally adopted when they took possession of the Canaanitish soil. Thanksgiving offerings were made on this occasion to Yahwe as the "Baal," to whom the land belonged. Since the presentation of such gifts, consisting of the first-fruit sheaf, involved a visit to a Yahwe sanctuary, the occasion became a *hag*—the ancient Semitic designation for a mirthful festival with dances and processions at a sanctuary and a sacrificial meal as the symbol of communion between the god and his worshippers. It was customary at this festival to eat only unleavened bread, which merely represents the usual food during the harvest season, when the people, busy with field labors, did not take time to wait in baking their bread until the completion of the slow process involved in the leavening of the dough; hence the festival became known as the *hag ha-masgôth*, i.e., the festival of unleavened bread. On the other hand, the sacrifice of the *pesach* stands in no connection with agriculture. It is considered by

some scholars as originally a rite of propitiation or lustration observed during a pestilence or on some other special occasion. It consisted in sprinkling with blood the entrance to the house (or tent), which was particularly sacred. It is still customary among the Bedouins to sprinkle their camels and flocks with blood as a protection against the ravages of a pestilence. This blood rite, from being indulged in on extraordinary occasions, became a regular custom observed in the spring, the bearing time of the flocks, when it became especially important to secure the protection of the deity. Other scholars have recently maintained that *pesach* originally was the festival of the vernal full moon. They point out that the *pesach* offering is to be slaughtered in the evening, "when the sun has set" (Deut. xvi. 6), that all the meat must be eaten during the night before the rising of the sun (Ex. xxxiv. 25, xxiii. 18; Deut. xvi. 4 ff.), and that this festival night is that from the fourteenth to the fifteenth of Nisan, consequently the night of full moon in the spring month. These two festivals—one belonging to the agricultural stage, the other either a survival of the nomadic stage or more probably a vernal full-moon festival likewise taken over from the former inhabitants of Palestine—were in course of time brought into connection with the Exodus from Egypt and combined with each other. The combination once made, there resulted a series of ceremonial observances which gradually assumed the elaborate character of the Jewish Passover festival. The sprinkling of the blood became the symbol of the protection granted the Hebrews by Yahwe at the time that pestilence struck the Egyptian households. The sacrificial lamb and the unleavened bread were also brought into connection with the Exodus—the former pictured as a ceremony indulged in on the eve of the departure of the people, the latter a symbol of the "haste" with which the deliverance was brought about, so that the people did not have time to bake bread from leavened dough. In later Judaism the historical association was still further emphasized, and there grew up an elaborate service for the eve of the Passover, known as the *seder*, the chief features of which were the recalling of the Exodus by reciting the narrative in the household, the preparation of dishes symbolizing the affliction and hardships of the people in Egypt, together with thanksgivings and songs of praise accompanied by benedictions over wine for the miraculous deliverance. For eight days unleavened cakes are eaten, and no food prepared of any leaven material is to be eaten. In fact, all traces of leaven are to be removed out of the house, and in orthodox Jewish households separate sets of dishes are used during the eight days of the Passover. In the Christian Church the paschal lamb became preëminently the type of the sacrifice of Christ.

Bibliography. Consult the commentaries on Exodus by Dillmann (Leipzig, 1880), Ryssel (ib., 1887), Baentsch (Göttingen, 1900), Holzinger (ib., 1900), Bennett (Oxford, 1908), McNeile (New York, 1908), Driver (ib., 1911); H. C. Trumbull, *The Threshold Covenant* (ib., 1896); R. Schäfer, *Das Passah-Mazzot Fest nach seinem Ursprung und seiner Entwicklung* (Gütersloh, 1900); and for the later Jewish customs, Schröder, *Satzungen und Gebräuche des talmudisch-rabbinischen Judenthums* (Bremen, 1851); L. N. Dembitz, *The Jewish Services in Synagogue and Home* (Philadelphia, 1898); Alfred Jere-

mias, *Das alte Testament im Lichte des alten Orients* (2d ed., Leipzig, 1906; Eng. trans. by C. L. Beaumont, 2 vols., New York, 1911); Benzinger, *Hebräische Archäologie* (2d ed., Tübingen, 1907).

PASSOW, päs'só, FRANZ (1786–1833). A German philologist. He was born at Ludwigs-lust, studied at Leipzig, and was called in 1807 to the chair of Greek in the Weimar Gymnasium and in 1815 to that of ancient literature in the University of Breslau. His principal work is his important *Handwörterbuch der griechischen Sprache* (2 vols., 1819; 4th ed., 1831; complete revision by W. Crönert, Göttingen, 1912 et seq.). He also published *Grundzüge der griechischen und römischen Literatur- und Kunstgeschichte* (2d ed., 1829) and other volumes. Consult J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

PASSPORT (Fr. *passeport*, from *passer*, to pass + *port*, Lat. *portus*, port, harbor). A written instrument issued by the authority of a government for the identification and protection of its citizens when traveling abroad. It is, first, a certificate of the citizenship of the bearer and, second, a formal permit authorizing him to leave the state of which he is a subject. The origin of the practice of granting passports grew out of the right of nations, which was formerly more frequently exercised than now, to withhold from foreigners the right of transit through their territory. The formal permission granted to a foreigner by a government to pass through its territory was a passport. To avoid the inconvenience of this requirement the practice was adopted by which a subject of one government leaving his country for travel in another obtained from his government a certificate of citizenship which was accepted by the other government as a passport. This is presented to the foreign government as an identification of the bearer, who, instead of receiving a passport from the foreign government, is given permission to pass through by the act of an officer in putting a *visé* upon the certificate itself. At present Russia, Turkey, Portugal, and Greece are the only European countries where travelers cannot travel freely without passports, though some of the German states require certification for the purpose of police protection, where parties desire to reside for a considerable period in one place. In the United States passports are issued only by the Department of State and only to citizens upon application supported by proof of citizenship. No distinction is made between native-born and naturalized citizens in the granting of passports. The fee is \$1, and a passport for the head of a family includes the wife and minor children. In foreign countries they may be obtained by citizens of the United States only by the chief diplomatic representative or by the consul general or, in the absence of both of these officers, by a consul. A fee of \$5 is allowed to be charged for each passport granted to a citizen of the United States abroad by a diplomatic representative. An application to a diplomatic officer for a passport by a native citizen must be accompanied by a written declaration under oath stating the name, age, and place of birth of the applicant, supported if possible by the affidavit of a creditable person to whom the applicant is personally known. If the applicant claims to be a naturalized citizen he must produce a copy of the decree of the court by which he was naturalized. In both cases an oath of allegiance is

required for transmission to the Department of State. Every such passport to be valid must be renewed either at the Department of State or at a legation of the United States abroad at the expiration of two years from its date. Passports are not granted to aliens who have declared their intention to become citizens of the United States, although they may obtain authenticated certificates of their declaration of intention, which entitle them to a qualified protection while traveling abroad. Nor are they granted to naturalized citizens who may be inferred from long residence abroad and other circumstances to have abandoned their nationality. The chief value of a passport is that it provides the holder with authentic proof of his national character and frees him from inconveniences which he might otherwise experience while traveling in foreign lands. If lawfully issued it is *prima facie* evidence of citizenship, and as such must be respected not only by the administrative officers, but by the courts of the government where the holder may be sojourning; but it furnishes no exemption from the jurisdiction of the country in which he may be. It is nothing more than a request to foreign governments to admit the bearer to the enjoyment of the rights and privileges to which he as citizen of the country issuing the passport may be entitled by treaty or convention.

In some European states no subject is allowed to depart therefrom without first securing a passport from his government authorizing him to leave the country. Where this rule prevails the passport is required to be countersigned by the minister or consul of the country which the bearer visits. In time of war passports or safe conducts are frequently granted by military commanders to allow persons to pass through the lines or to insure the safety of officers while in the performance of some duty which takes them beyond the lines. They may also be granted for the passage of goods as well as for individuals. Diplomatic representatives upon departing from a state in which they have been residing usually demand and receive passports to enable them to withdraw in safety.

PASSY, *pa'sé'*, FRÉDÉRIC (1822-1912). A French political economist and statesman, the father of Paul Passy. He was born in Paris. Establishing himself as a lawyer, in 1846 he was appointed auditor to the Council of State. He entered politics, but the proclamation of the Second Empire caused him to withdraw because of unwillingness to countenance the coup d'état of Louis Napoleon. From 1860 to 1863 he delivered free lectures, in various French cities, on social-science topics. In 1868 he founded the International League of Peace. After the fall of the Second Empire he reentered political life and from 1874 to 1889 represented various departments in the Chamber of Deputies. From this time on he devoted all his energies to the cause of pacifism. In 1887 he helped Sir W. R. Cremer (q.v.) to found the Interparliamentary Union to promote arbitration and peace. He had been elected to the Academy of Moral and Political Sciences in 1877, and was also a member of the International Permanent Peace Bureau at Bern. In 1901 he shared with Henri Dunant the first Nobel peace prize. In May, 1912, the members of the principal societies of political economy met at the Sorbonne to celebrate his ninetieth birthday and the seventieth of his presidency of the Society of Political Economy,

but Passy himself was unable to attend because of failing health. By this time he had become completely blind. He wrote, in addition to numerous articles in reviews: *Mélanges économiques* (1858); *Leçons d'économie politique* (1860-61); *La question des octrois* (1866); *La guerre et la paix* (1867); *Communauté et communisme* (1869); *De l'importance des études économiques* (1873); *La solidarité du travail et du capital* (1877); *L'Histoire et les sciences morales et politiques* (1879); *L'Héritage du XIXe siècle* (1900); *Historique du mouvement de la paix* (1905).

PASSY, PAUL EDOUARD (1859-). A French phonetician, son of Frédéric Passy, born at Versailles. After teaching in the Normal School of Auteuil he was elected in 1894 assistant director of the Ecole des Hautes-Etudes at Paris. His works deal principally with pedagogy and with general and comparative phonetics. He founded the Association Phonétique des Professeurs de Langues Vivantes, and later the Association Phonétique Internationale, being the principal originator of the alphabet now almost universally used by phoneticians. His works include *Le français parlé* (1886; 6th ed., 1908); *Les sons du français* (1887; 7th ed., 1913; Eng. trans. by Savory and Jones, 1907; 2d ed., 1914); *Etude sur les changements phonétiques* (1890); *Elementarbuch des gesprochenen Französisch* (2 vols., 1893), with F. Beyer; edited *L'Origine des Ossalois*, by his brother Jean Passy, who died in 1898 (1904); *Dictionnaire phonétique de la langue française* (2d ed., 1914), with Michaelis; *Petite phonétique comparée des principales langues européennes* (2d ed., 1912); *Abrégé de prononciation française* (3d ed., 1906); *Choix de lectures françaises phonétiques* (1904); *Lectures variées mises en transcriptions phonétiques* (2d ed., 1909); and the *International French-English and English-French Dictionary* (1904), with G. Hempl.

PASTA, *pà'stà* (née NEGRI), GIUDITTA (JUDITH) (1798-1865). An Italian singer and one of the most distinguished opera sopranos of modern times. She was born near Milan and received her musical education partly at Como, under the chapelmaster of the cathedral there, and partly in the conservatory at Milan. After 1811 she appeared at various theatres of the second rank in northern Italy. Her first great triumph was achieved at Verona in 1821. The year following she was engaged at the Paris Italian Opera, where her singing excited great admiration. From 1825 to 1830 was the period of her greatest triumphs, which were won principally in London and Paris. Vienna, where she accepted an engagement in 1832, witnessed the last. Some time afterward she practically withdrew from the stage and purchased a villa on the banks of Lake Como. Her last appearance occurred in London in 1850, but then her voice was seriously impaired. She had a magnificent voice, which easily passed from clear, shrill soprano notes to the gravest contralto tones, besides which she had great dramatic energy and a stateliness of manner that suited lofty and imposing characters. Her principal rôles were in *Medea*, *Desdemona*, *Semiramide*, *La Sonnambula*, and *Norma* (these operas were written for her by Bellini), and *Giulia* in *Romeo e Giulia*. Donizetti and Pacini also wrote operas for her.

PASTE. A substance composed of various agglutinants applied to paper, leather, etc., to cause them to adhere to similar surfaces or to

cardboard, fabrics, a plastered wall, or other unlike materials. It is commonly made of starch, flour, and gelatin in proportions varying with the uses to which it is to be put. An essential oil is sometimes added to prevent fermentation and overcome any objectionable odor. For paper hanging and bookbinding pastes are made by cooking wheat or rye flour, to which glue and sometimes silicate of soda are added. For photographic mounting starch is often the chief constituent, a useful mountant being made by mixing one part of good white starch with two or three parts of cold water to form a smooth, creamlike paste, which, with constant stirring, is poured into six to eight parts of boiling water. Heat for five minutes, stir, and strain. Ordinary starch paste will keep for only two or three days, but oil of cloves or a few drops of carbolic acid will preserve it much longer. Another formula in common use for mounting photographs is: Soak 1 ounce gelatin in 10 fluid ounces alcohol; to this add $\frac{1}{2}$ to 1 ounce glycerin and dissolve by gentle heating. Another recipe for office, library, or photographic purposes is: Gum tragacanth, 2 ounces; white dextrin, 1 ounce; wheat flour, 6 ounces; glycerin, 1 ounce; when dissolved in 4 ounces cold water add 40 ounces boiling water and stir until of uniform consistency. Polishing paste for polishing brass, copper, nickel, and other metallic surfaces is made of finely ground pumice, talc, or infusorial earths combined with some oil as a vehicle.

PASTE EEL. See EELWORM.

PASTEL, pás-tél' (Fr. *pastel*, from Lat. *pastillus*, little roll, lozenge, dim. of *panis*, loaf, bread). A mixture of chalk with pigments, bound together with gum water or some other medium into a sort of paste. This is dried into small cylinders or stocks, with which the design is drawn on rough paper, cardboard, or specially prepared canvas. It is drawn either with the point or the edge of the stick, as in other crayon drawing, or with the side of it, in which case the color is spread with the aid of the finger tips, sometimes even of a brush. As the pigment is spread on the paper or canvas in the form of a dry powder, not all of which adheres, pastels are easily damaged. This is often guarded against by the use of a fixative, a kind of varnish—a practice esteemed undesirable because it darkens the color. If carefully protected from dust, sunlight, and damp, a pastel will preserve its freshness longer than any other medium (witness the French pastels of the eighteenth century), never darkening like oil or absorbing moisture like water color. Its special beauty consists in the soft velvety surface, giving a bloom and depth of color harmonies not otherwise obtainable. As its chief qualities are freshness and charm, it is not adapted to the grand style of painting, to historical or religious subjects, but rather to portraits, still life, and to certain varieties of genre and landscape painting. It is the medium of the colorist rather than the draftsman and offers great facility to the rapid workman.

History. Drawings in colored chalk were used in Italy as early as the fifteenth century, chiefly as studies for paintings. During the sixteenth century the practice increased, in Italy as in other countries, e.g., Holbein's wonderful drawings are often touched with color. But these earlier efforts are not properly pastel, which did not become an independent art until the second half of the seventeenth century. In Ger-

many Thiele (1685-1752), to whom the invention of pastel has been attributed, was the first to perfect the art, and he was followed by Anton Raphael Mengs (q.v.), Johann Heinrich Schmidt, and others. Rosalba Carriera (q.v.) (1675-1757) was easily the first artist of Italy, and one of the foremost of Europe, in this medium. But it was in France during the eighteenth century that pastel reached its highest perfection. It has been appropriately identified with the fragile beauties of the rococo and found expression in a series of inimitable portraits. The chief master was Quentin de la Tour (q.v.) (1704-88), but about him gathered a galaxy of important masters—Chardin, Lancret, Greuze, Boucher, Vigée Le Brun (q.v.), Louis Tocqué, Perronneau, Vivien, and others. Liotard, the Swiss, and Roslin (qq.v.), the Swede, are also best classed with the French school of the eighteenth century. The earliest English pastelists of note was John Riley (1640-91), the most prominent John Russell (q.v.) (1745-1806). The art was practiced also by a number of the miniaturists, such as Cosway, Engleheart (qq.v.), and others.

During the nineteenth century pastel painting was in abeyance until the seventies, since when it has again come into vogue. As in the eighteenth century, the most important development has been in France, which was also the first to revive the art. Among recent French artists prominently identified with pastel painting are Fantin-Latour, Degas, Raffaelli, Charles Leandre, Gaston La Touche, Besnard, and Jules Cheret. In Belgium the art was successfully practiced by Emile Wauters and Khnopff; in Germany by Friedrich von Lenbach, Max Liebermann, and Franz Stuck; in England by McLaren Hamilton, J. J. Shannon, Walter Crane, W. J. Rothenstein, and others. Among American artists pastel was first used with success by Whistler, then by William Chase, James Alden Weir, Thomas W. Dewing, Robert Blum, J. Wells Champney, and Mary Cassatt. Other American masters of this technique are Everett Shinn, whose genre scenes of New York life are well known; Colin Campbell Cooper, Albert Sterner, Jerome Myers, W. J. Glackens, and George Bellows. Consult: Karl Robert, *Le pastel* (Paris, 1890); Julius Ritscher, *Anleitung zur Pastellmalerei* (4th ed., Dresden, 1900); Haldane Macfall, *French Pastellists of the Eighteenth Century* (New York, 1909); R. R. M. See, *English Pastels, 1750-1830* (ib., 1911); also the biographies of the artists mentioned.

PASTERNAK, pás'tér-nák, LEONID OSSIPOVITCH (1862-). A Russian genre and portrait painter and draftsman. He was born in Moscow and studied at the Munich Academy under Herterich and Liezen Meyer. He is perhaps best known for his charming drawings in black and white and in color, his specialty being scenes from the nursery and family life; but his "Students before Examination," in the Luxembourg, Paris, and "Tolstoy in his Family Circle" and "A Professional Meeting," both in the Alexander Museum, St. Petersburg, bear witness also to his high rank as a painter. His art is essentially pictorial, intimate, and realistic, full of warm feeling which never degenerates into sentimentality, and his technique is brilliant and varied. He illustrated the works of Tolstoy and other Russian authors. Pasternak became professor at the Moscow Art School. He received gold medals at Munich (1897) and Paris (1900).

PASTEUR, pás'tér', Louis (1822-95). A celebrated French biological chemist and pathologist, born at Dôle (Jura), Dec. 27, 1822. He early devoted himself to the study of chemistry, graduating from the Ecole Normale, Paris, in 1847. In 1848 he became professor of physics at Dijon and in the following year accepted the professorship of chemistry at Strassburg. In 1854 he was called to Lille as dean and professor of chemistry in the faculty of sciences. Here he remained until 1857, when he went to Paris as scientific director of the Ecole Normale Supérieure and was elected a member of the Institute. In 1863 he became professor of geology, physics, and chemistry at the Ecole des Beaux-Arts and from 1867 to 1889 was professor of chemistry at the Sorbonne. Later he carried on his researches at the Institut Pasteur, Paris, of which he was director until his death and where he was surrounded by such men as Calmette, Chamberland, Metchnikoff (q.v.), Yersin, and Roux (q.v.), who became his successor. He died near Saint-Cloud, Sept. 28, 1895.

The results of Pasteur's investigations have formed contributions of the highest importance to nearly every branch of physical and natural science. By his classical researches on optically active substances and their separation into isomeric modifications of identical chemical but different physical properties, Pasteur became the founder of the science of stereochemistry (q.v.). In the province of fermentation and the germ theory his work was even greater. He showed that lactic, butyric, acetic, and other fermentations are caused by microorganisms, and established on a firm scientific basis the principle that spontaneous generation cannot take place, at least under ordinary conditions. The different processes of putrefaction and fermentation set up by the air are invariably produced by germs, the presence of which in the atmosphere Pasteur demonstrated by passing a current of air through guncotton and dissolving the latter in a mixture of alcohol and ether; an insoluble residue was thus obtained, in which the germs of organisms could be readily seen with the aid of a microscope and could be shown to be capable of developing into mature organisms. See MILK PRODUCTION; PASTEURIZER.

Pasteur's studies on the diseased conditions of wine and beer have rendered possible and easy the prevention of these conditions. No less important were his investigations on the silkworm's disease pébrine and its cure. His discovery of bacteria as the cause of anthrax (splenic fever) in cattle was epoch-making in the science of diseases. Similar results were obtained with regard to fowl's cholera; and his experiments show success in preventing the various diseases caused by septic bacteria by inoculating animals with a milder form of the disease by means of a weaker brood of bacteria artificially cultured. Pasteur found that by keeping a cultured crop of specific microorganisms at a certain temperature with a full supply of oxygen he could reduce organisms to an incapacity for producing spores, therefore to sterility. But before this point is reached the cultured organism loses its virulence, although still germinating; vaccination with it then produces a mild disease, which effectually protects from the fatal scourge of splenic fever, of fowl's cholera, and other diseases.

In the same manner he dealt with splenic apoplexy, which he showed to be caused by the

presence of specific bacteria in the blood. Pasteur's well-known treatment of hydrophobia is based on a similar principle, the spinal column of the infected animal serving as culture medium. See HYDROPHOBIA.

Besides important articles in the *Annales de Chimie*, his writings include: *Nouvel exemple de fermentation déterminée par des animalcules infusoires pouvant vivre sans oxygène libre* (1863); *Etudes sur le vin, ses maladies, causes qui les provoquent* (1866); *Etudes sur le vinaigre, sa fabrication, ses maladies, moyens de les prévenir* (1868); *Etudes sur la maladie des vers à soie* (1870); *Nouvelles études sur la maladie des vers à soie, etc.* (1871); *Etudes sur la brève* (1876; Eng. trans., *Studies on Fermentation*, 1879); *Les microbes* (1878), jointly with Tyn-dall; *Sur les maladies virulentes et en particulier sur la maladie appelée vulgairement choléra des poules* (1880; Eng. trans., *The Attenuation of the Virus of Fowl Cholera*, 1886); *Résultats de l'application de la méthode pour prévenir la rage après morsure* (1886; Eng. trans., *Researches on Vaccination for Rabies*, 1886); *Nouvelle communication sur la rage* (1886); *Le traitement de la rage* (1886; Eng. trans., *Rabies*, 1890). Consult: Bournand, *Un bienfaiteur de l'humanité: Pasteur, sa vie, son œuvre* (Paris, 1896); C. A. Herter, *The Influence of Pasteur on Medical Science* (Baltimore, 1904); René Val-lery-Radot, *Life of Pasteur*, English translation by Mrs. R. L. Devonshire (2 vols., London, 1911); Stephen Paget, *Pasteur and after Pasteur* (ib., 1914); Keim and Lumet, *Louis Pasteur*, English translation by F. C. Cooper (New York, 1914), containing a bibliography.

PASTEUR INSTITUTES. Laboratories at which the Pasteur method of treatment of hydrophobia is employed. See HYDROPHOBIA.

PASTEURIZER, pás'tér-iz'ér. An apparatus for preserving by means of heat wines, milk, and other solutions from deterioration. The term is derived from Pasteur (q.v.), the French bacteriologist, who first showed the application of heat in killing the microorganisms which cause souring and other changes in wine. In Pasteurization a temperature which destroys or inhibits the growth of bacteria is employed, varying from 130° F. to 160° F. or higher and continued from 10 minutes to a half hour, whereas in sterilization boiling is used and often repeated. Continuous Pasteurizers are employed in creameries and milk-bottling establishments, the heat being supplied by steam and a continuous stream of the milk passing through the apparatus. See MILK PRODUCTION.

PASTICCIO, pá-stét'chó (It., medley). In music, a term applied to works that are patched up from various earlier works of a composer. In the eighteenth century operatic composers did not always trouble themselves to compose new music to a new text. They took arias or choruses from their other earlier operas and adapted them to a new text. Handel made liberal use of this inartistic device, even in some of his best works. Thus the famous chorus from the *Messiah*, "For unto us a child is born," is not original, but the music is taken note for note from a madrigal composed by Handel himself in 1712.

PASTILLES, pás-tél'z'. See TROCHES.

PASTO, pás'tó. The capital of the Department of Nariño, Colombia, near the border of Ecuador and 120 miles northeast of Quito (Map: Colombia, B 3). It is situated at an altitude

of 8650 feet in the midst of a large plain at the foot of the volcano of the same name. The town is well constructed, with broad, well-paved streets and many fine private residences. The educational institutions are the University of Nariño, a normal school, and a number of private schools. The town is an episcopal seat. It has manufactures of woolen blankets, hats, and decorated pottery. Pop., 1912, 27,760. Pasto was founded by Pizarro in 1539. It was twice burned during the wars of independence and ruined by an earthquake in 1834, in which 10,000 people perished.

PASTON LETTERS. The correspondence of the Paston family in Norfolk, England, including over 1100 letters, together with a few state papers which came into the family's possession. The letters cover the years 1422-1509 and are of the utmost value as affording us our only glimpse into the public and private life of the time. They were first published by Sir John Fenn in five volumes (London, 1787-1823), the last volume appearing by another hand after the principal editor's death. The disappearance of the manuscripts after their publication naturally led to doubts as to their genuineness. Gairdner defended their authenticity on the grounds of internal evidence, and the soundness of his argument was completely proved by the subsequent reappearance of several volumes of the lost manuscripts. He also prepared an admirable edition of the letters in three volumes (London, 1872-75; reprinted in 1896), with an introduction containing a full history of the Paston family. A new edition by the same editor, containing 105 new letters, appeared in four volumes (London, 1900-01) and another edition in six volumes in 1904.

PASTOR (Lat., shepherd; so called because frequently seen near flocks of sheep). The popular as well as the generic name of certain birds of the starling family (Sturnidae). They differ from starlings in the compressed and slightly curved bill. In habits, as in structure and food, the groups are very similar. (See OXPECKER.) They are confined to the Old World, and especially to the Orient, though one species, the rose-colored pastor, or rose starling (*Pastor roseus*), glossy black with pink back and abdomen, is occasionally seen (sometimes in vast flocks) about the Mediterranean. It is not only a very handsome bird, but is very useful, especially where locusts occur, as the pastors eat the young locusts greedily and are for this reason sometimes called locust birds (q.v.). In India the species is numerous and familiar and is included with the mynas. See Plate of LAKE AND STARLINGS.

PASTOR, päs'tör, LUDWIG (1854-). A German historian, born at Aix-la-Chapelle. He studied at the universities of Bonn, Berlin, and Vienna, became instructor at Innsbruck in 1880 and professor of history there in 1886. In the preparation of his historical works he made extensive research in the archives of Germany, France, and Italy, particularly those of the Vatican, first made accessible by Leo XIII. His chief publication is his *Geschichte der Päpste seit dem Ausgang des Mittelalters* (1886-95; 4th ed., 1899-1901; Eng. trans., London, 1891-98), an extensive and thorough history of the papacy from the close of the Middle Ages. Other volumes by him are *Die kirchlichen Reunionsbestrebungen während der Regierung Karls V.* (1879) and *Die Korrespondenz des Kardinals Contarini*

während seiner deutschen Legation (1880). He revised vols. i-vi of Janssen's *Geschichte des deutschen Volkes* (1903-07) and edited vols. vii and viii of the same work (14th ed., 1903).

PASTOR, TONY (ANTONIO) (c.1835-1908). An American theatrical manager, born in New York City. In 1843 he was featured as a "child prodigy" at P. T. Barnum's Museum, then traveled with circuses and minstrel shows, appeared as a singer at the Bowery Music Hall, New York, in 1859, managed a concert hall in 1861-65, and was proprietor of a variety theatre on the Bowery in 1865-75 and of one on Broadway in 1875-81. Thereafter until his death he managed Tony Pastor's Theatre in the building of Tammany Hall, New York. Pastor is generally considered the originator of modern vaudeville, and many successful comedians appeared under his management.

PASTORAL EPISTLES. A subgroup in the collection of New Testament letters which in their several addresses claim to have been written by the Apostle Paul. They comprise the following three writings: 1 Timothy, 2 Timothy, and Titus. They are called pastoral because of the rather unusual character of their contents, as compared with the Apostle's other letters, being addressed to helpers of the Apostle whom he had left in pastoral care of certain fields, and whom he wished in these communications to instruct regarding the duties involved in their charges. See the article on the individual Epistles.

PASTORAL POETRY (Lat. *pastoralis*, relating to a shepherd, from *pastor*, shepherd). A kind of poetry in which the incidents, thoughts, and emotions of cultivated society are presented under the disguise of rustic life. The characters are shepherds and shepherdesses, in a setting of valley and hillside, and the usual theme is love. This artificial literary genre flourished in antiquity and for centuries throughout western Europe. The oldest extant forms are the idyl and the eclogue, but the pastoral motive may enter the romance and the drama.

Antiquity. The pastoral undoubtedly takes its root far back in Greek literature. According to *Ælianus* (*Varia Historia*, x, 18) its inventor was Stesichorus of Himera in Sicily (who died about 555 B.C.); and his subject was the blindness of Daphnis, afterward the typical lovelorn shepherd. According to the ancient grammarians it originated in the rustic cult of Artemis at Syracuse (*Scholion* upon Theocritus). These traditions certainly point to very old folk songs now lost. The extant pastoral dates from Theocritus, who flourished about 270 B.C. at the courts of Syracuse and Alexandria. To him are attributed 31 idyls (little pictures of life), of which 10 are strictly bucolic. Here first occur Thyrsis, Tityrus, Corydon, Damoetas, Daphnis, Lycidas, Menalcas, and Amaryllis, names since made familiar to western Europe. Theocritus seemingly reproduces the language of the peasants, their melodies, superstitions, and custom of answering one another in verse. His idyls are short descriptive lyrics combined with little dramatic pieces, sometimes comic, like the mimes which had been popular in Sicily since Sophron (fl. 440 B.C.). The poet introduces himself under the name of Simichidas and devotes an idyl to his patron Ptolemy Philadelphus of Alexandria, and another to Hiero II of Syracuse. Theocritus was followed by two poets: Bion of Smyrna, known for his beautiful *Lament for*

Adonis, and Moschus, author of the still more beautiful *Dirge* for Bion. Several centuries later an unknown Greek writer told the story of *Daphnis and Chloe* in prose. The theme of the romance is artless innocence; its tone is sensuous and decadent. The pastoral poem had already been adapted to Italy by Vergil (died 19 B.C.). However much Theocritus may have idealized his country scenes, he yet had nature before his eyes. The purely artificial pastoral began with Vergil, who took his notes not so much from nature as from Theocritus. Vergil composed 10 graceful bucolics, which he called *eclogæ* (i.e., selections). Like Theocritus, he wove into them incidents from his own life. From Vergil the pastoral motive spread to Horace, Catullus, and other Roman poets and eventually throughout western Europe.

Italy. The pastoral of the Renaissance did not spring from Vergil alone. To it contributed the *pastourelles*, love songs with a rustic setting, which were cultivated in various countries of southern Europe in the thirteenth century. They especially flourished in Provence as early as the twelfth century, whence they were largely diffused. They were in no way connected with Vergil, but they seem to have had their source in folk song. In the fourteenth century the two streams of influence—the native and the classic—united to form the modern pastoral. The Vergilian revival first took the form of allegories, in which the learned addressed Latin epistles to one another under pastoral names. Eclogues of this kind passed between Dante and Giovanni del Virgilio, professor of Latin at Bologna (c.1320). Dante figures as Tityrus and his friend as Mopsus. Petrarch (1304–74) also composed a pastoral in 12 eclogues, in which he worked out an elaborate allegory. Dante and Petrarch thus mark the reappearance of Vergil as a literary force. Boccaccio (1313–75) blends the ancient and the indigenous pastoral. He wrote Latin eclogues much in the manner of his great compatriots. His *Ameto* (1342) is the first pastoral romance in the vernacular. He took as his model the song fable in which prose is employed for the narrative and verse for the expression of the feelings. Under the names Caleone and Fiammetta, Boccaccio veiled his passion for Maria, natural daughter of King Robert of Naples. The *Ameto*, with its disguised personal history and cross loves, is the prototype of the later Italian pastoral romances, of which a famous specimen is the *Arcadia* (1504) by Jacopo Sannazaro. Another aspect of the pastoral, which indeed is found in Petrarch, was rendered by Baptista Spagnolus, generally known as Mantuan (died 1516), whose works were Englished by George Turberville in 1567. His rustics were made a medium for fierce satire on women, the court, and the Church. Attention has already been called to the dramatic element in the pastoral as early as Theocritus. When the popularity of the mediæval mystery play began to wane, the pastoral drama, easily expanded from the eclogue, was one of the forms that took its place. Even in Boccaccio's *Ninfale Fiesolano* the pastoral begins to assume a dramatic turn. But the first distinctive pastoral drama is the *Orfeo* of Poliziano, a sort of opera given at Mantua in 1372. It is founded on the story of Orpheus and Eurydice. During the next century many similar pastorals were produced at the Italian courts. By far the best of them is the *Aminta* of Tasso, performed at

Ferrara in 1573. Equally well known in its own time was the *Pastor Fido* of Guarini (1590).

Spain. In the Spanish peninsula the native pastoral songs counted for much more than elsewhere. As early as 1300 the *pastourelle* was cultivated at the court of Dom Diniz, King of Portugal. And in Spain proper the Christmas mystery play, performed by real shepherds, was in fact a pastoral. The way was thus prepared for Juan de Encina (died 1534), who, besides translating Vergil's eclogues, composed pastoral pieces for recital (c.1492) before audiences at the house of the Duke of Alba. To this time belong also the pastoral lyrics by Garcilaso de la Vega (died 1536), one of Spain's greatest poets. Under Italian influences the pastoral romance made its appearance with the *Menina e Moça* (Girl and Maiden) of the Portuguese Ribeiro (died 1550). It was followed by the more famous *Diana* (c.1559) of Montemayor, a Portuguese by birth who chose to write in Spanish. For Spain the pastoral sentiment received most refined expression in the *Galatea* (1584) of Cervantes.

France and Germany. In southern France the pastoral love song goes back to the twelfth or thirteenth century. At the outset this kind of poetry belonged to the country folk, who sang it especially in May, but it early became a stereotyped artistic form. A knight, happening to come where a shepherdess is, makes love to her, but he is usually dismissed. This is the theme of all. No pastorals of genuinely popular design have survived. The pastoral soon appeared in northern France. From the beginning of the thirteenth century the French *pastorelle* strongly influenced that of Provence. The shepherd Robin or Robert was adopted in the south, and Marion, too. The old theme blooms charmingly in the *Jeu de Robin et de Marion* (c.1283) by Adam de la Halle. Though the song fable of *Aucassin et Nicolette* (c.1225) contains delightful rustic scenes, it is hardly a true pastoral. During the sixteenth century the pastoral disguise was sometimes employed by the poets. Clément Marot (died 1544) addressed an eclogue to the King, in which he described the course of his life under the symbol of the four seasons. The pastoral ideal, enforced by translations of the Italian *Arcadia*, the Spanish *Diana*, and the Greek *Daphnis and Chloe*, culminated in the *Astrée* (1610–25) of Honoré d'Urfé (q.v.), an immense prose romance. Here the bucolic life reached its extreme idealization. The nymphs appear in gilded buskins, arms adorned with bracelets, and heads covered with garlands of pearls. From the *Astrée* the pastoral made its way into Germany, where it flourished for more than a century. Of the German pastorals may be cited the *Hercynia* of Opitz (1622), the *Daphnis* (1754) and the *Idyllen* (1756) of Gessner, the *Luise* (1794; and complete, 1795) of Voss, and Goethe's *Hermann und Dorothea* (1797), in which the idyl returned to the truthfulness and simplicity of Theocritus.

England. Before the sixteenth century there was nothing beyond the realistic treatment of the shepherd scenes in the religious drama, and *Robene and Makyn* of Robert Henryson (died c.1500), written in Scottish. The pastoral on the continental model made its first English appearance in the six dull eclogues of Alexander Barclay (died 1552). They closely resemble the work of Mantuan. In 1563 appeared eight equally dull eclogues by Barnabe Googe. To

Tottel's Miscellany (1557) Surrey contributed two beautiful pastoral songs in the Italian manner. The important date for the English pastoral is 1579, when Edmund Spenser published the *Shepherd's Calendar*, the best English pastorals. In 12 eclogues under this title Spenser handles the leading motives—allegory, satire, and love. During the next quarter of a century English literature became saturated with pastoral sentiment. In all the great writers lived the image of a "golden world" somewhere in Arcadia or the Forest of Arden. The pastoral poem was cultivated in many lyrics, of which may be cited Marlowe's *Passionate Shepherd*, and in many collections, as *Britannia's Pastorals* of William Browne and the *Eclogues* of George Withers. Of romances inspired originally by Italy and Spain, the most typical is Sir Philip Sidney's *Arcadia* (1590), which had many imitators. There was, moreover, another large group of romancers, at the head of whom stood Robert Greene and Thomas Lodge, the authors respectively of *Menaphon* (1589) and *Rosalind* (1590). Undying charm was given to the pastoral ideal by Fletcher, Ben Jonson, and Shakespeare, in *The Faithful Shepherdess*, *The Sad Shepherd*, and *As You Like It*. A generation later Milton placed the masque in an exquisite pastoral setting and composed his great dirge in the manner of Moschus (*Comus* and *Lycidas*). After Milton the English pastoral fell into sad ways. The pastorals of Pope and Ambrose Philips, each published in 1709, are utterly conventional. Their imagery, when not borrowed, is either false or so general as to convey nothing. In ridicule of Philips, John Gay professed to depict rustic life with the gilt off. His *Shepherd's Week* (1714) probably comes somewhere near country manners. William Shenstone wrote several pretty ballads, in which appear Strephon and Chloe. We come to something better in Allan Ramsay's *Gentle Shepherd* (1725), a genuine picture of Scottish rural life. Later in the eighteenth century the pastoral was fused with other forms of descriptive poetry and hardly existed as an independent species. The pastoral elements may, however, be uncovered. For example, the summons from the city to the country, so frequent in Cowper, is a motive of Spenser. And the lyrics of Burns, many of them, are pastoral songs. The Vergilian type of pastoral has become thoroughly discredited. But several of the greatest English poets in the nineteenth century drew upon the Sicilian idyllists. There they found truth, grace, and charm. The two finest dirges since Milton, Shelley's *Adonais* and Arnold's *Thyrsis*, go back to Bion and Moschus. Pastoral themes were beautifully rendered by Landon in some of his *Hellenics* (1847), e.g., "The Hamadryad." Theocritus is easily discovered in Tennyson's *Dora* and *The Miller's Daughter*.

Bibliography. Material for the history of the pastoral is scattered. Consult: Andrew Lang (trans.), *Theocritus, Bion, and Moschus*, in "Golden Treasury Series" (New York, 1880); Gaspary, *Geschichte der italienischen Litteratur* (Berlin, 1885-88); better in the translation of Zingarelli, *Storia della letteratura italiana* (Turin, 1889-91); E. C. Stedman, *Victorian Poets* (New York, 1887); F. M. Warren, *History of the Novel Previous to the Seventeenth Century* (ib., 1895); Smith, "Pastoral Influence in the English Drama," in *Modern Language Association, Publications* (Baltimore, 1897);

Gregg, *Pastoral Poetry and Pastoral Drama* (London, 1906); J. C. Dunlop, *History of Prose Fiction* (new ed., with notes, etc., by Henry Wilson, 2 vols., ib., 1906); E. K. Chambers, *English Pastorals* (New York, 1906); Edmund Spenser, *Shepherd's Calendar*, edited by C. H. Herford (new ed., ib., 1907); H. M. Hall, *Idylls of Fishermen* (Columbia University Press, ib., 1912); and the authorities referred to under FRENCH, PROVENÇAL, and SPANISH LITERATURES.

PASTORAL STAFF. See COSTUME, ECCLESIASTICAL; CROSIER.

PASTORELS, or **PASTOUREAUX** (OF. *pastorel*, Fr. *pastoral*, from Lat. *pastoralis*, relating to a shepherd). A name given to two movements which appeared in France—one about 1250, the other in 1320. They were recruited from the lower orders of society, including many shepherds, whence the name. In the year 1251 a certain Jacob, who claimed to be Lord of Hungary and is commonly known as Jacob of Hungary, appeared as their leader in Flanders. The King, Louis IX (St. Louis), was then in the East, engaged in the disastrous Seventh Crusade, and the preceding year had been a prisoner in the hands of the Mohammedans. Jacob preached that God had rejected princes and the mighty and would free the Holy Land by means of the common people. He claimed to have special revelations and assumed ecclesiastical functions.

Encouraged by the Queen mother, he formed his followers in well-organized companies, and, ostensibly on the way to Palestine, they began to overrun the country. The true character of the movement soon became evident. The rulers were attacked, property was destroyed, priests and monks were murdered, and the Jews in particular suffered cruel persecution. The disorders were ultimately put down with a firm hand. Jacob was killed while haranguing a crowd in Paris, or, according to another account, in a conflict at Bourges. In 1320, under Philip V, similar disorders broke out under the same pretext of a crusade to Palestine. These bands of Pastorels ultimately threatened to attack Avignon, when the Pope, John XXII, excommunicated them and the seneschal of Carcassonne dispersed them with an army. Many were slain, but scattered bands long continued to ravage the south of France. Consult Berger, *Histoire de Blanche de Castille* (Paris, 1895), and Le chugeur, *Histoire de Philippe le Long* (ib. 1897).

PAS'TOR FI'DO. See GUARINI.

PASTORIUS, FRANCIS DANIEL (1651-1719). An American colonist, born at Sommerhausen in Franconia, Germany. Having joined the Society of Friends while in England, where he met William Penn, Pastorius in 1683 led a party of German and Dutch Mennonites to the new Colony of Pennsylvania, where they founded Germantown. He was a man of noble character and deep learning and exerted great influence among his countrymen. Five years after his arrival in America he signed a protest addressed to the Friends' yearly meeting in Burlington, N. J. which characterized slavery as unchristian. This protest is said to have been the first formal plea for emancipation made in America and is the subject of Whittier's "Pennsylvania Pilgrim." Whittier also translated the Latin ode to posterity which Pastorius prefixed to the Germantown book of records. Among his other writings is an interesting *Geographical Description of Pennsylvania*, first published under the title

Umständige geographische Beschreibung der allerletzt erfundenen Provinz Pennsylvaniae (1700).

PASTURE, PASTURAGE (OF. *pasturage*, from ML. *pasturare*, to pasture, from Lat. *pastura*, Fr. *pâturage*, from OF. *pasturer*, Fr. *pâture*, feeding, pasture, from *pasci*, to feed; connected with *pastor*, shepherd, *pabulum*, food, OChurch Slav. *pasati*, to feed, Skt. *pā*, to protect). In English and American law, the right of one to turn his cattle or sheep into public or common land or into the land of another for grazing purposes. In the case of private land such a right may arise by agreement, and such is generally the origin of the right in the United States. At common law the owner of pasture land, known as an agister, had no lien on the cattle for the agreed price of pasturing them, but such a lien has in some of our States been conferred on him by statute. The transaction constitutes a bailment for mutual benefit, and accordingly the agister is liable, like any other ordinary bailee, for injuries to the cattle resulting from lack of ordinary care on his part.

In England rights of pasture are frequently found in the nature of permanent rights in another's land known as profits *a prendre*. These, like easements or like other profits (such as the right to take wood or minerals from the land of another), may arise by grant or prescription. Rights of this nature were formerly known as commons or rights of common (Blackstone describes the right under consideration as "common of pasture"), not because they were enjoyed by the community as a common right, but apparently for the reason that the person who had acquired the right, whether by grant or prescription, usually enjoyed it in common with the owner or possessor of the land. Where the right was exclusive even of the owner, it was described as a "sole" or "several" profit. Where the right of pasture was of this character and perpetual, it was deemed to vest possession of the land in the grantee of the right.

A right of pasture may either be appurtenant to land of the person having the right, i.e., the land on which the pasturing cattle belong (on which they are "levant and couchant"), or it may be "in gross," i.e., personal to the owner of cattle to be pastured. In the former case the right passes on the conveyance of the land, as an incident thereof; in the latter case it may be conveyed separately, as a right in gross, but only if it is restricted to a certain number of cattle. In England also a right of pasture may exist as a "common appendant" to arable land, for oxen used to plow the land and for kine and sheep to manure the land. This variety of common exists only by prescription and probably dates back to a time when the lands subject to the right were common in fact, i.e., open to the community for pasturage. Consult Sir William Blackstone, *Commentaries on the Laws of England* (4th ed., 2 vols., Chicago, 1899), and works cited under EASEMENT and REAL PROPERTY. See COMMON; PROFIT.

PASTURE, PASTURAGE. Pasture is here used in its limited sense, and pasturage as meaning the growing grass and herbage on which stock feeds. The area of the ranges, those great natural pastures of the Rocky Mountain and Great Plains regions, is decreasing as the land is being brought under cultivation by settlers. The pampas of South America and to some extent the steppes of Asia are vast natural feed-

ing grounds corresponding to our ranges. Sometimes the different kinds of farm animals are confined in one enclosure, but most farmers have a separate pasture for swine. Horses and cattle are generally pastured together, although they sometimes annoy and injure each other. Sheep graze much closer than horses and cattle and so place the latter at a disadvantage when pastured with them, while, on the other hand, they are useful in keeping down certain weeds which horses and cattle do not eat. A dairy herd is always most profitably pastured by itself. In the United States, and in all countries where new lands are brought into cultivation, the native prairie is often used for pastures, while in older countries or long-settled regions the cultivated soil is laid down to grass for this purpose. Native grasses are hardy and adapted to the prevailing conditions of soil and climate, so that when they are used the element of uncertainty is entirely eliminated. Pasturing more stock than can be well fed in a pasture of this kind has the effect of killing out the grasses and encouraging the growth of weeds, especially during times of drought. Occasional light applications of well-rotted barnyard manure, followed by a thorough harrowing, are very beneficial when the sod has become unproductive and hard. The care of native pastures further requires that the weeds be always kept down and that hardy tame or wild grasses be sown on places where the sod is becoming bare.

The practice of laying down land to pasture is common in all farming regions and often forms a part of the crop rotation. Pastures on cultivated land intended for only a few years are called temporary pastures and those for a long series of years permanent pastures. In starting pastures on cultivated land the first and most important requisite is a good condition of the soil. The kinds of soil best adapted for pastures are loams and clays, while loose, sandy, and gravelly soils are entirely unsuitable in this connection. Before the land is seeded down the soil is brought to the best possible condition of cultivation and fertility, and if the natural drainage is inadequate artificial drains are laid. A high state of fertility is conducive to a luxuriant growth of grass and a rapid formation of a good sod. A heavy dressing of barnyard manure is well adapted to grass lands, because it not only furnishes all the necessary elements of plant food, but also has a beneficial effect on the mechanical condition of the soil. It is preferable to lay land down to pasture after a hoed crop like corn, which leaves the soil in a good condition of tilth and comparatively free from weeds. The methods of preparing the soil and sowing the grass seed are the same in pasture making as in laying down land to grass for a meadow (q.v.).

The choice of grasses depends largely upon the conditions of climate and soil. On ordinary soils in regions where the rainfall is generally sufficient, Kentucky blue grass (*Poa pratensis*), Canada blue grass (*Poa compressa*), tall fescue (*Festuca elatior*), redtop (*Agrostis vulgaris*), perennial rye grass (*Lolium perenne*), orchard grass (*Dactylis glomerata*), and red and white clover form a good mixture for pastures. Redtop, alsike clover, creeping bent grass (*Agrostis stolonifera*), and perennial rye grass are grown in wet pastures, and red fescue (*Festuca rubra*), redtop, Kentucky blue grass, and white clover in pastures on light sandy soils. In the Southern States Bermuda grass (*Cynodon dactylon*), car-

pet grass (*Paspalum platycaule*), large water grass (*Paspalum dilatatum*), and Texas blue grass (*Poa arachnifera*) are valuable pasture grasses. Timothy (*Phleum pratense*), an excellent hay grass, is often sown for pasture, but it is rather subject to injury by the trampling of stock and close grazing, and it does not form a good turf. Unlike the course pursued for meadows, in selecting pasture grasses those species are sought which furnish a succession of green forage throughout the season. For temporary pastures annual and biennial crops and short-lived grasses are suitable, but for permanent pastures perennial and good turf-making species are required.

Many farmers grow forage crops near their pastures to feed to the stock during times of drought, to prevent injury being done by too close cropping. The droppings of the stock are not sufficient to keep up the fertility of the soil, and hence, as mentioned above, top dressings of barnyard manure and commercial fertilizers are applied to supply the deficiency. The droppings of cattle ought to be broken up and scattered over the ground. Harrowing a pasture in the spring admits heat and light into the soil and favors the growth of grasses and leguminous plants. Weeds should never be allowed to grow in pastures, and the coarsest and rankest grass should be mowed once or twice each year. Re-seeding old pastures is usually not so profitable as breaking and working up the sod and growing a few crops before the land is again seeded down. An abundance of pure water in pastures is a prime necessity. A few trees on the highest points where the stock can find cool shade are of great benefit. A paddock is a small pasture generally located near the barns. Consult W. J. Spillman, *Farm Grasses of the United States* (New York, 1909), and M. J. Sutton, *Permanent and Temporary Pastures* (London, 1911). See MEADOW.

PASTURE, MRS. HENRY DE LA. See DE LA PASTURE, MRS. HENRY (LADY CLIFFORD).

PASZKOWSKI, päsh-köf'ské, WILHELM (1867-). A German educator, born in Gumbinnen. Educated at the University of Berlin, he was employed in the university library from 1892 to 1899, when he became assistant in the Royal Library. In 1902 he became librarian there and was made lector of the German courses for foreign students in the university. Two years later he was put in charge of the university's academic information bureau (Akademische Auskunftsstelle für wissenschaftliche Anfragen). He wrote: *Adam Smith als Moralphilosoph* (1890); *Berlin in Wissenschaft und Kunst* (1910); *Berlin und seine Universität* (1914, and in English); guidebooks for foreign students in Germany; and the report on *German International Progress in 1913* (1914), made to the Carnegie Endowment for International Peace.

PATAGONIA. A name formerly applied to the whole south portion of the South American continent, extending from the Strait of Magellan indefinitely northward to about the thirty-eighth parallel of south latitude. In its present use, though the name has no political significance, it is generally restricted to the region lying east of the Andes and south of the Río Negro (Map: Argentina, F 7). The name is supposed to be derived from the Spanish word *patagón* (a large foot), in allusion to the large footprints found by the first explorers; but it may also come from the Quichua word *patacuna*

(terraces). The region was visited by various Spanish and English explorers after it was first seen by Magellan in 1520. It remained unclaimed by any country until 1881, when it was incorporated into Argentina, while the strip west of the Andes was given up to Chile. The latter portion now constitutes the Chilean Territory of Magallanes (q.v.), and Patagonia proper consists of the Argentine territories of Río Negro, Chubut, and Santa Cruz (qq.v.).

Bibliography. H. H. Prichard, *Through the Heart of Patagonia* (London, 1902); Princeton University expeditions to Patagonia, 1896-99, *Reports* (8 vols., Princeton, 1901-11); T. Falkner, *Descripción de la Patagonia* (Buenos Aires, 1911); F. B. Loomis, *Hunting Extinct Animals in the Patagonian Pampas* (New York, 1913); B. Willis, *Northern Patagonia* (ib., 1914). See ARGENTINA; CHILE; POLAR RESEARCH; and, for the inhabitants, TEHUELCHES.

PATAGONIAN CAVY. See CAVY.

PATALA, pä-tä'lä. In Hindu mythology, the name of a series of lower worlds, each 10,000 *yōjanas*, or miles, in depth. According to the Puranas (q.v.), they are usually seven in number: Atala, Vitala, Sutala, Rasatala, Talatala, Mahatala, and Patala. Other authorities make eight: Patala, Tala, Atala, Vitala, Tala, Vidhi-Patala, Sarkara-Buhmi, and Vijaja. These regions are entirely distinct from the Narakas (see NARAKA), or hells, and are inhabited by various classes of semidivine beings such as the Nagas, or serpents. The soil is white, black, purple, yellow, sandy, stony, and golden, respectively, and they are embellished with magnificent palaces, decorated with brilliant jewels, and filled with delicious viands and wines. There are in these regions beautiful groves and streams and lakes, where the lotus blows and the skies are resonant with the songs of birds. Consult Wilkins, *Hindu Mythology* (2d ed., London, 1900).

PATALIPUTRA, pä'tä-lé-pōō'trä. A famous city of ancient India and the capital of the Kingdom of Magadha (q.v.). It was situated at the junction of the Son (Skt. *Sōna*, classical *Erannobos*) River with the Ganges. It seems, therefore, to have stood near the site of the modern city of Patna. It was the chief city of the Nanda and Maurya dynasties and is famous as the residence of Megasthenes (q.v.) during his stay in India about 305 B.C. It was also called Palibothra, Pushpapura, and Kusumapura, both of the latter terms meaning "Flower City."

PAT'AMAR (East Indian name). A species of sailing vessel or boat used along the coast of India, especially in the vicinity of Bombay. It is of the grab (q.v.) type, is fast, and has a large carrying capacity. It was formerly much used for carrying dispatches, but steam vessels have now superseded it in this work.

PATAN, pä-tän', or PATTAN. A town in the State of Baroda, India, 55 miles northwest of Ahmadabad (Map: India, B 4). It contains over 100 Jain temples and is celebrated for its collections of Jain manuscripts of palm leaf. It occupies the site of Anhilvada, the ancient capital of the Gujarati Kingdom, which was captured by Mahmud of Ghazni in 1024. The principal products are swords, embroidery, silk, and pottery. Pop., 1901, 31,402; 1911, 28,339.

PATAN. A town in Gujarat, India. See SOMNATH.

PATANJALI, pä-tün'jä-lé (probably second century B.C.). The founder of the Yoga

(q.v.) system of Hindu philosophy. There seems to be little reason to doubt that he actually composed the *Yōga sūtras*, edited and translated by Rajendralala Mitra (Calcutta, 1883), which formulate the principles of the Yoga philosophy. He is generally regarded, probably correctly, as the author of the *Mahā-bhāṣya*, edited by Kielhorn (3 vols., Bombay, 1878-85), a commentary on the *Vārttikas*, or Explanations, of Katayana (q.v.), which form in their turn a commentary on the grammar of Panini (q.v.). Consult: R. Garbe, *Sāṃkhya und Yoga* (Strassburg, 1896); Max Müller, *Six Systems of Indian Philosophy* (New York, 1903); Paul Deussen, *Outlines of Indian Philosophy* (Berlin, 1907); Desai, *Study of Indian Philosophy* (Bombay, 1906); A. A. Macdonell, *History of Sanskrit Literature* (London, 1913).

PATAPSCO RIVER. A river of Maryland, which flows in a southeasterly direction into Chesapeake Bay, 13 miles south of Baltimore (Map: Maryland, F 2). The volume of the stream is comparatively small, but as it has a considerable current there have been established along its course numerous water-power stations which are valuable to Baltimore.

PATARINES, or PATARENES, pāt'ā-rēnz. A name applied in Milan in the eleventh century to the reforming party, who held their meetings in the Pataria, or ragmen's quarter. Under the leadership of Anselm of Lucca and the deacon Arialdo they took energetic steps to suppress clerical concubinage and simony. They were supported by Pope Nicholas II, but the emperors and many of the nobility opposed them forcibly, and as a popular movement the Pataria died out early in the twelfth century. The name of Patarini was, however, appropriated by the Cathari (q.v.) or Manichean heretics of northern Italy and southern France and was also used for the Bogomiles (q.v.) of Bosnia and Herzegovina. Consult A. Krüger, *Die Pataria in Mailand* (Breslau, 1873-74).

PATAS (pā-tās'; African name) **MONKEY.** One of the guenons (*Cercopithecus*, or *Erythrocebus*, *patas*), a native of Senegal, west Africa, distinguished from all others by its reddish color and grayish cheeks and underparts. It is usually to be seen in menageries. See **GUENON**.

PATA'VIAN. The Roman name of the modern Padua.

PATCH, SAM (UEL) (1807-29). An American noted for various feats of leaping. He was born in Rhode Island, went to sea in early life, and afterward settled at Paterson, N. J., where he was a cotton spinner. Because of his threats to jump from a bridge over the Passaic River he was finally placed under arrest. A few months later the successful performance of the feat gave him such widespread notoriety that he traveled about, leaping from the yardarms or diving from the topmasts of ships. He lost his life in making a jump of 125 feet into the Genesee River below the falls at Rochester, N. Y.

PATCHOGUE, pā-chōg'. A village in Suffolk Co., N. Y., 55 miles east of New York City, on the shore of Great South Bay and on the Long Island Railroad (Map: New York, B 2). It is popular as a place of residence and as a summer resort and has several hotels, fine church edifices, a high school, and a public library. The village has extensive oyster and fish interests, an ice and cold-storage plant, lumber yards, and manufactories of lace curtains and surveyor's steel tapes and supplies. It was incorporated

in 1893. The government is administered by a village president, who holds office for a year, and a board of trustees, elected on a general ticket. Pop., 1910, 3824; 1915 (State census), 4500.

PATCHOULI, pā-chō'li (Fr., from the East Indian name). The powerfully odoriferous dried branches of *Pogostemon patchouli* or *Pogostemon heyneanus* of the family Labiatae, which first appeared in commerce in 1844. The plant is a native of the Malay coast, Ceylon, Java, the neighborhood of Bombay, and probably also of China and Japan. The odor of patchouli was known in Europe before the material itself was introduced, because of its use in keeping moths out of Cashmere shawls; hence genuine Cashmere shawls were known by their scent until the French found the secret and imported the herb. In India, where it is known as puchapat, it is used as an ingredient in fancy tobaccos, as a perfume for the hair, and for keeping insects from linen and woolen articles. Patchouli yields by distillation a peculiar heavy brown oil, disagreeably odoriferous, which requires extreme dilution for perfumery purposes.

PÂTÉ DE FOIE GRAS, pāt'ā de fwā grā (Fr., paste of fat liver). A dish, sometimes called Strassburg pie, resembling a very delicately seasoned potted meat, greatly esteemed by epicures, and, as the name indicates, made of the abnormally large and fat livers of artificially fattened geese or ducks. The pâtés, ordinarily covered with rendered goose fat as a protection from the air, are usually marketed in earthenware pots. Strassburg and Toulouse are the chief places of manufacture. The pâtés are exported to every part of the world, and the trade amounts to several hundred thousand dollars annually. The fowls are fed and "stuffed" to repletion with salted maize, and by this means the liver is increased to the unnatural weight of two, three, or more pounds.

PATELLA (Lat., small pan or dish, kneepan, patella), or **KNEECAP.** A sesamoid bone, developed in the common tendon of the rectus, vastus externus, and vastus internus muscles—the great extensor muscles of the leg. It is of rounded, somewhat heart-shaped form, the broad end being directed upward and the apex downward. The anterior or external surface is convex, perforated by small apertures for the entrance of vessels, and marked by rough longitudinal striæ, while the posterior or internal surface is smooth and divided into two facets by a vertical ridge, which corresponds and fits into the groove on the lower articulating surface of the femur or thigh bone, while the two facets (of which the outer is the broader and deeper) correspond to the articular surface of the two condyles.

This bone is liable both to dislocation and fracture. Dislocation is rare. It may occur either inward or outward, most frequently the latter. The displacement may be caused either by external violence or by too sudden contraction of the extensor muscles in knock-kneed, flabby persons. It may be readily detected by the limitation of active motion and by the bone being felt in its new position; the dislocation is easily reduced.

Fracture of the patella may (like dislocation) be caused either by muscular action or by external violence. The conservative treatment consists in relaxing the opposing muscles by raising the trunk and slightly elevating the limb, which should be kept in a straight posi-

tion, while straps and other devices are applied directly to the fragments to secure their close approximation. In consequence of the great difficulty of bringing and retaining the broken surfaces in exact apposition, it is difficult to obtain bony reunion of the parts, and the treatment often results either in mere ligamentous union or in no true union at all. The end in these cases is a loss of power to completely extend the leg.

The operative treatment consists in cutting down on the fragments and fastening them together with catgut, wire, or some other form of suture. It is attended with remarkably perfect results, but is not devoid of danger to the joint. A measure intermediate between operative and nonoperative treatment consists in the application of hooks, pegs, nails, or other devices which seize the fragments through the skin and hold them in apposition until union has taken place. See illustration in KNEE JOINT.

PATELLA. See LIMPET.

PATEL/LAR REFLEX. See KNEE JERK.

PAT'EN (Lat. *patena*, *patina*, flat shallow dish, from *patere*, to lie open; connected with Gk. *περαννίνα*, *petannynai*, to spread out). The plate on which the bread in the eucharistic service is consecrated, sometimes used also for the distribution to the faithful. In the earliest centuries it was of wood, glass, or the more ordinary metals and underwent the same changes as the chalice (q.v.), which it accompanied. As early as the fourth century, however, patens were often made of silver or gold, weighing 30 pounds and more. These early examples were of large size and called *patenæ ministeriales* or *communicales*. The smaller patens (*patenæ parvæ*) for the use of the celebrant at the altar were of far later origin. Special patens were used for the chrism in baptism and confirmation (*patenæ chrismalis*). Patens were usually circular, though later examples are sometimes polygonal or square. A very few examples remain of the Byzantine and Romanesque periods, of silver with decoration in low relief, niello, or enamel.

PATENIER, JOACHIM. See PATINIR, JOACHIM.

PÂTENÔTRE (DES NOYERS), păt'nôtr' (dă nwă'yă'), JULES (1845-). A French diplomat, born at Baye, Marne. He was educated at the Ecole Normale Supérieure, entered the diplomatic service in 1871, held posts in Greece, Persia, Argentina, China, and Sweden, and in 1884-85 had charge of the negotiations to regularize the French protectorate in Annam and signed a treaty of peace at Tientsin with Li Hung Chang. Pâtenôtre then served as Minister in Morocco in 1888-91; in the latter year was transferred to Washington, where he was Ambassador in 1893-97; and was Ambassador to Spain from 1897 to 1902. He published *Souvenirs d'un diplomate* (1913 et seq.).

PAT'ENT (from Lat. *patens*, lying open, patent, pres. p. of *patere*, to lie open; originally in the phrase *litteræ patentes*, letters patent, open letters). In the most general sense a grant by the sovereign or the state to an individual of any property, franchise, privilege, or title; specifically such a grant to an inventor or discoverer of a useful art or device of the exclusive right to make, manufacture, and sell for a certain period the thing invented or discovered by him. By the common law an inventor has

no protection in the exclusive use of his invention in the absence of a patent conferring such a right upon him. The policy of encouraging useful discoveries and inventions in the arts and industries by securing to discoverer and inventors the exclusive benefits of their discoveries is an old one among governments. It was a common practice among the Tudor sovereigns of England to grant to inventors such exclusive privileges, a power which was much abused until it was controlled and regulated by the famous Statute of Monopolies, passed in the twenty-first year of James I (1624). This statute restricted the grant of such rights to "the true and first inventor" and limited it to a fixed term of 14 years. It is still in force though it has been amended by successive enactments, now embodied in a comprehensive Patent Act, 1907. The British policy of encouraging by exclusive privilege the invention of new and useful articles was extended to the English Colonies in America, and we find occasional Colonial statutes empowering certain persons to exercise the exclusive right to manufacture articles of use which they have invented.

The Constitution (Art. I, Sec. 8) of the United States recognized and sanctioned the policy by conferring authority upon Congress to secure to inventors the exclusive use of their invention for limited periods of time. In pursuance of this authority Congress in 1790 passed the first national Act providing for the granting of patents to the inventors of "any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used." Applications for patents under this law were required to be made to a board consisting of the Secretary of State, the Secretary of War, and the Attorney-General. The patent was issued by this board upon the concurrent action of two members, was authenticated by affixing the great seal of the United States, and was valid for such term not exceeding 14 years as the board might in its discretion agree upon. The Law of 1790 contained provisions for the punishment of infringements and provided that no distinction should be observed between foreigners and American citizens in the granting of letters patent. In 1793 a new statute was passed, repealing the Act of 1790 and making several changes in the system. The new Act restricted the grant of patents to citizens of the United States; required applicants to surrender to the United States any patents which they might have received from any State prior to the adoption of the Constitution; provided that application should be made to the Secretary of State, the conflicts between applications should be decided by a board of three arbitrators, and that patent obtained by fraud or misrepresentation could be declared void by a United States district court upon due proof. Supplemental Acts were passed in 1794 and 1800. About this time the judicial question arose as to whether the power of Congress was exclusive in the matter of patent (*Gibson v. Ogden*, 9 Wheat. i.), but the precise point as to the right of a State to grant patent was not decided. Since then, however, the opinion has become settled that the power of Congress in the premises is exclusive.

The year 1836 marks the beginning of a new era in the patent system of the United States. In that year all previous statutes were repealed and a comprehensive Act was passed which brought the system substantially into its present

condition. It created a patent office to be attached to the Department of State, at the head of which was to be a commissioner of patents; it introduced the policy of preliminary examinations for the purpose of determining the patentability of an invention and provided for a board of appeal to hear appeals from the decisions of the examiner and Commissioner against the patentability of an invention. The patent privilege was now extended to any alien who had resided one year in the United States and who had made a declaration of intention to become a citizen. Provision was also made for filing caveats on uncompleted inventions, and the policy of reissuing patents was confirmed and extended. Exclusive jurisdiction of cases involving patent rights was conferred upon the United States Circuit Courts. Provision was also made for extending the duration of patents for a period of 7 years after the expiration of the original 14. Various amendments of the patent laws were made during the succeeding years. In 1842 provision was made for patenting designs for a period of 7 years. By an Act of 1861 the term of patents for inventions was extended from 14 to 17 years, all former acts discriminating between aliens and citizens were repealed, a uniform scale of fees was adopted, and a board of examiners intermediate between the regular examiners and the Commissioner was established to hear appeals from the former. Finally, in 1870, the whole system of patent legislation was revised and codified and brought into its present condition.

As the laws now stand (Rev. Stat., § 4886) any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may upon payment of the fee required by law obtain a patent therefor.

Patents are obtained by making application to the Commissioner of Patents in accordance with forms prescribed by law. The form prescribed is that of a petition together with an oath that the applicant believes himself to be the first inventor. The application is accompanied by a specification describing the invention in a full, clear, and concise manner. Drawings accompany the specification in cases which admit of it, and the Commissioner may require the applicant to furnish the office with a model of the article, but this of late years has not usually been required except when necessary to a correct understanding of the article. The application upon being received is referred to the proper examiner for inquiry as to whether the article possesses novelty and utility and whether it has already been anticipated in the United States or abroad. If no objection is found by the examiner the patent is issued. If objection is raised by the examiner the applicant may amend his application so as to eliminate from the claims the features to which exception has been taken. If still refused he may appeal to the board of examiners, and from their decision he may appeal to the Commissioner of Patents. Finally, an appeal lies to the Court of Appeals of the District of Columbia. The fee upon filing an application is \$15; on issuing

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the patent, \$20; on application for reissue of a patent, \$30. A prior patent by the inventor in a foreign country does not debar him from receiving a patent in the United States, provided the application be made within seven months of the application for the foreign patent.

The Statute of 1870 permitted the inventor of an incomplete invention to protect himself against the anticipation of his patent by filing in the Patent Office a caveat describing the invention and asking that his rights be protected, but this provision was repealed by Act of Congress in 1910.

The judicial interpretations of the provisions of the statute above outlined form the great body of the substantive law of patents in the United States. The alternative use of the words "invention" and "discovery" early attracted attention, and the question arose as to whether different meanings were to be ascribed to them. It was undisputed that the mere discovery of a force of nature could not be patentable, as natural forces and elements belong to all mankind, and it was finally determined that the word "discovery" as used in the statute was synonymous with "invention" and involved the exercise of inventive or creative genius. For example, the person who discovered electricity as a force could not have obtained a patent allowing him the exclusive use of that force of nature, but Morse, who applied electricity to the communication of messages, was allowed a patent on his system of telegraphy, as that was a device calling for inventive genius in its creation and was not merely the finding of an already existing thing.

Under the word "art" many of the processes now held patentable are classified. A process is a combination of the elements or laws of nature designed to accomplish a useful result. The word "machine" includes all contrivances whereby mechanical parts or pieces are arranged to move together for the production of some useful result, and it is under this head that most patents are granted in the United States. The word "manufacture" is construed to mean anything new, made by the hand of man, which is not included in the other terms employed in the above sections, and covers fabrics, furniture, clothing, etc. The term "composition of matter" is defined as the uniting of two or more elements or substances by chemical union or by mechanical mixing, and includes such products as paints, medicines, etc. Frequently it is very difficult to determine under which of the above heads an invention should properly be classified, but it is held not to be absolutely essential for an inventor to do so, provided it is certain that his invention comes under one or more of them. The section allowing patents for designs is liberally construed to include ornamental as well as useful designs.

A thing for which a patent is asked must have the three general characteristics prescribed by the statute, viz.: it must be an invention; it must have novelty, i.e., be new; and it must be useful. The determination of whether a thing presented really constitutes an invention is sometimes a very difficult matter. In general it may be said that it is not invention to devise something that is not a practical working device but needs more thought or experiment to enable it to produce the result; or to construct or produce something which any mechanic or reasonably skilled person in the particular line would produce, upon request, in the exercise of his ordi-

nary skill; or to put better materials or workmanship into a known article; or to change the size of a thing; or to omit a useless or dead part of a machine or device; or to substitute an equivalent which merely performs the same office as the part taken away without improving the operation of the whole; or to make a new or double use of a known article without improving on it, as by utilizing the principle of an ice-cream freezer for the purpose of preserving fish. A person who produces a combination of elements or of mechanical devices need not be able to explain the scientific reasons for their combination or adjustment in the particular manner or form in which he presents them in order to be considered the inventor, provided he can describe the materials and the combination or construction in such a way that the same result can be accomplished again. See INVENTION.

A distinct and original improvement on an old invention is patentable, but a patent on the improvement does not disturb the rights of the inventor of the first device to its exclusive use as it was. It is not necessary that an inventor be personally able to construct the device which he has conceived, if he can dictate his ideas to a skilled mechanic so that the latter can readily construct the device without the exercise of his own inventive genius. However, the mere conception of a result without a practical means of attaining it is not invention.

The word "new" in the statute is not confined to its ordinary meaning, but includes anything which has not before been made public or been given to the world. For example, if A presents a model of a machine together with an application for a patent on it, at the Patent Office, he is first entitled to a patent, although another inventor may later bring there a machine identically the same as the first and be able to prove that he had conceived and constructed it long before A, provided the inventor who first conceived the machine had not used it or made it public in any way. However, if the thing which is sought to be patented has been previously used in a single instance by other parties, even though that use was not known to the public at large nor to the person seeking to have it patented, it is sufficient to defeat a claim for a patent on the device presented, through want of novelty.

The statute also requires that an invention to be patentable must be useful. This requirement is liberally construed, and almost anything which is not injurious to public health or morals can be patented if it contains the other essential characteristics and contributes to the comfort, convenience, or pleasure of mankind. Thus, a toy intended for the amusement of children may be patented as a useful article.

A patent will be issued only to the inventor, except that, if he dies before making application, his personal representatives are permitted to do so, and that he may sell his rights in his invention before obtaining a patent and have the patent issued to his assignee. Joint inventors must have their inventions patented to both jointly.

Foreign inventors may obtain patents in the United States subject to the condition that if their inventions are not known in the United States before they make application, and a citizen of the United States has made the same invention without knowledge that it had previously been produced abroad, the latter can obtain a

patent in preference to the former, even though his application be filed subsequently. Where an employee makes a new thing under the guidance and direction of his employer, the latter is entitled to the patent, as he is the actual inventor; but if an employee, independently of the suggestions of his employer, conceives and produces something which is patentable, he is entitled to the patent, as his inventive faculties alone were employed; but the employer may by the terms of his contract with the employee be entitled to an assignment of the patent.

Before or after filing an application an inventor may abandon his invention to the public by express acts or words or by such conduct that an intention to do so may be presumed. Delay in making or completing an application and lack of public exhibition or use of the invention are considered evidence of abandonment. However, if the inventor was too poor to defray the expenses of an application, or was unable, through temporary insanity, illness, or any other reasonable cause, to make application, the above presumption will be rebutted.

Where a patentee has reason to believe that his patent is defective by reason of an insufficient description in the specifications, or that his claims were not broad enough to include all the principles of his invention, or if there was an error affecting it in the Patent Office, he may surrender the old patent and at the same time file an application to have a new one issued to him upon proper specifications. This is known as surrender and reissue. A good patent cannot be thus surrendered for the purpose of having a new one containing the features of a subsequent improvement issued to the inventor. The reissue must be for the same invention.

Where a claim in a patent covers more than the patentee is lawfully entitled to, the patent is void. However, where this has occurred through inadvertence or mistake, the patentee may file an instrument known as a disclaimer, which should contain a clear statement of what he justly claims as his own invention and what he disclaims. Unless this is done such a patentee cannot maintain an action to protect whatever rights he is actually entitled to in the invention.

Where two or more patents contain claims which are identical they are known as interfering patents. In such a case any one of the patentees may bring an action in equity to have the respective rights of the interfering patentees determined, and only one of the patents can be sustained as valid.

Patents are considered as property, and may be sold and transferred by assignments in writing. Provision is made for recording such assignments in the Patent Office, and unless this is done within three months after its date an assignment will be void as against innocent purchasers or mortgagees for value. Patents may be held by joint owners, partners, or corporations. An owner of a patent may convey a part interest in it, or grant a license to another to use it upon payment of royalties or a fixed rent, or may grant the right to make and sell it for an agreed period.

All patented articles should be marked with the word "patented" and with the exact date on which the patent was granted. Unless this is done no damages can be recovered in an action for an infringement, if the infringer had no previous notice of the existence of the patent.

Where an unpatented article is marked "patented" the person so marking it is liable to a penalty of not less than \$100 and costs, to be recovered in a *qui tam* (q.v.) action, one-half of which goes to the informer and the other half to the government.

An infringement of a patent consists in wrongfully making, using, or otherwise dealing with a patented invention. A person to whom the patentee sells a patented machine may make necessary repairs from time to time, but they must not amount to a reconstruction of the machine, and he cannot build a new machine without being guilty of an infringement. Many cases of infringement arise in regard to patented compositions of matter by an infringer substituting an equivalent for one element. A patentee has two remedies for an infringement. He may sue at law for damages or may apply to a court of equity for an injunction restraining the infringer from continuing his acts and incidentally be awarded damages for the injury suffered. If the patented article is properly stamped it is no defense that the infringer had not seen or heard of it.

From the earliest period through 1913, 1,093,223 patents had been issued by the United States government and (estimated) 2,455,810 by foreign governments. In 1913, 35,788 patents were issued in the United States out of 70,376 applied for, 31,382 to citizens of this country and 4212 to citizens of foreign countries; 164 were reissued and 30 withdrawn. It is estimated that during the same year, 1913, 104,907 patents were issued in foreign countries. Of the patents taken out by foreigners Germany claimed 1433, England 908, Canada 557, and France 340.

Bibliography. H. C. Merwin, *Patentability of Inventions* (Boston, 1883); Carpmael, *Patent Laws of the World* (London, 1899); A. H. Walker, *Text-Book of the Patent Laws of the United States* (4th ed., New York, 1904); Henry and Charles Howson, *Patents: A Manual Relating to United States Patents for Inventors and Patentees* (4th ed., Philadelphia, 1904); W. C. Fairweather, *Foreign and Colonial Patent Laws* (New York, 1911); J. L. Hopkins, *Law of Patents and Patent Practice in the Patent Office and Federal Courts* (2 vols., Chicago, 1911); Berthold Singer, *Patent and Trade Mark Laws of the World* (ib., 1911); William Macomber, *Fixed Laws of Patents* (2d ed., Boston, 1913); W. F. Rogers, *Law of Patents as Illustrated by Leading Cases* (2 vols., Indianapolis, 1914); W. L. Symons, *Law of Patents for Designs* (Washington, 1914); and the official government reports of the United States, Great Britain, and other countries. See **LETTERS PATENT**; **MONOPOLY**; **TRADE-MARK**.

PATENT LEATHER. See **LEATHER**.

PATENT OFFICE. A government department or bureau established by Act of Congress in 1836, with a commissioner at its head charged with performing all duties relative to the granting of patents. In 1849 the Patent Office was transferred to the newly created Interior Department, where it has since remained. From the beginning provision was made for the collection and preservation of models, as a result of which an immense collection of specimens and designs has been gathered. In 1836 the building in which the models had been kept was burned and many of them were destroyed, but Congress made an appropriation of \$100,000 to procure duplicates of the most valuable ones. Again in

1877 a part of the building was burned together with many models, but the most of these were replaced by the manufacture of new ones.

The business of the Patent Office during the early years of its existence was small, the number of patents granted varying from 400 to 600 annually during the period from 1837 to 1847. In 1840 the applications for patents amounted to 765, while the number of patents actually issued was 473. In 1914 the number of applications was 67,774, while the number of patents granted was 39,945. The receipts of the Patent Office usually exceed the expenditures, although there have been exceptional years. In 1840 the receipts and expenditures were respectively \$38,056 and \$39,020; in 1914 they were \$2,251,893 and \$2,000,770. The Commissioner of Patents is required to make an annual report of the business of the office, giving with other information a list of patents issued during the year, with the names of the patentees. Specifications and drawings of all inventions are likewise published in a monthly volume. Until 1862 the Patent Office also published an annual volume on agriculture. An official gazette containing lists of patents, issued together with brief descriptions and drawings, decisions of the office on important questions arising in the course of the administration, and important judicial decisions affecting patents, is now one of the regular weekly publications of the office. The Commissioner of Patents is aided by an assistant commissioner, three examiners in chief, and a large number of examiners, each of whom has charge of a distinct class of inventions. Besides these there are several hundred assistant examiners, clerks, messengers, etc.

PATER, pâ'tâ', JEAN BAPTISTE JOSEPH (1696-1736). A French genre painter, born in Valenciennes. He studied under his father, Antoine Pater, a sculptor, and for a short time under Watteau. About 1717 he established himself in Paris, and by dint of hard work and miserliness amassed a considerable fortune, but died worn out at the age of 40. He was made an Academician in 1728. His art is copied after Watteau, but lacks his master's vivacity, invention, and poetic refinement. His methods are mechanical and his execution, which was forceful and lively in his earlier paintings, became more and more superficial. His figures are elegant, his heads graceful, and his color delicate and pleasing, but his landscapes are tiresomely conventional. The "Fête Champêtre" and "The Bath" are examples of the subjects he most frequently treats. Good examples are in the Louvre; in London in the South Kensington Museum, Buckingham Palace, and the Wallace collection; in the galleries at Edinburgh and Stockholm; and in the royal palaces at Potsdam, which latter contain the finest existing collection of his works. "The Comical March" is in the Metropolitan Museum, New York.

PATER, pâ'tēr, WALTER HORATIO (1839-94). An English essayist, born at Shadwell in the east of London, Aug. 4, 1839. He was educated at King's School, Canterbury, and at Queen's College, Oxford, graduating B.A. in 1862. In 1864 he was elected fellow of Brasenose College. Except for his visits to the Continent and a short residence in London, he passed his life at Oxford. He had come to the university with the intention of entering the Church of England, but by 1865, the date of his first visit to Italy, he had lost all belief in Christian doctrines. He

found his mission in interpreting to his age the spirit of the Renaissance in art and literature. For this end he employed the historical novel, the story, and, mainly, the essay. In all his work, much of which originally appeared in the reviews, he wrought with the greatest care, aiming at absolute precision in the expression of his thoughts and emotions. The result was an extremely delicate and refined style, delightful in its rhythm, but lacking in vigor and simplicity. After a quiet career as tutor and author Pater died at Oxford, July 30, 1894. His publications in book form comprise: *Studies in the History of the Renaissance* (1873), containing the brilliant essay on Winckelmann; *Marius the Epicurean* (1885), a masterly exposition of the best phases of Epicureanism, put into the form of an historical novel; *Imaginary Portraits* (1887), essays in philosophic fiction; *Appreciations* (1889); *Plato and Platonism* (1893); *The Child in the House* (1894), an imaginary portrait. After his death appeared *Greek Studies and Miscellaneous Studies* (1895); *Gaston de Latour* (1896); and a volume of essays collected from the *Guardian*, privately printed (1897). His *Works* in 10 volumes appeared in 1910 (New York).

Bibliography. E. W. Gosse, *Critical Kit-Kats* (New York, 1896); Ferris Greenslet, *Walter Pater*, in "Contemporary Men of Letters Series" (ib., 1903); A. C. Benson, *Walter Pater*, in "English Men of Letters Series" (ib., 1906); Thomas Wright, *Life of Walter Pater* (2 vols., ib., 1907), an elaborate and heavy-handed work, abounding in detailed information, but failing in sympathy and insight on both the biographical and critical sides; Edward Thomas, *Pater: A Critical Study* (ib., 1912); P. E. More, *Shelburne Essays*, 8th series (ib., 1913).

PATERAITE. See MOLYBDENUM.

PATERCULUS, GAIUS VELLEIUS (c.19 B.C.-c.31 A.D.). A Roman historian, descended from an ancient and wealthy Campanian family. He entered the army at an early age and from 4 to 12 A.D. served under Tiberius as *Præfectus equitum* or *legatus* in Germany, Pannonia, and Dalmatia. He was a great favorite with Tiberius, and, when the latter became Emperor 14 A.D., Paterculus was appointed prætor. He was alive in 30 A.D., as his history comes down to that year; but it is conjectured that in the following year he was perhaps put to death as one of the friends of Sejanus, of whom he speaks highly in his work. Paterculus' claim to remembrance lies in his *Historiæ Romanæ*, a compendium of universal, but more particularly of Roman, history, in two books. The work as we have it is not complete, the beginning and a portion following the eighth chapter being wanting. It seems to have commenced with the fall of Troy and describes only the most prominent historical incidents, but these, fortunately, with considerable fullness of detail. The editio princeps of the *Historiæ Romanæ* appeared at Basel in 1520. Later editions are by Kritz (Leipzig, 1840); Haase (ib., 1863); Halm (ib., 1876); and Rockwood (Boston, 1893). There is a partial English translation by Baker (London, 1814) and a complete one in the Bohn Library (ib., 1859). Consult W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910).

PATERERO, păt'ê-râ'rô (corrupted from *pederero*, from Sp. *pedrero*, swivel gun, from ML. *petraria*, stone-throwing engine, from Lat. *petra*, from Gk. *πέτρα*, rock). A small gun, firing a

shot weighing 12 pounds or less, formerly much used as a swivel. It was mounted on the ship's rail or in the bow of a boat. (See GUNS, NAVAL.) The name is also applied to a small mortar for firing salutes on holidays and at festivals, especially in Roman Catholic countries.

PATERINA. A genus of brachiopods found fossil in the lowest Cambrian rocks of North America and including the most primitive forms. It is semicircular in outline, with straight hinge line and no cardinal area. Its characters are repeated in the ontogenetic development of later brachiopods. See PALEONTOLOGY.

PATER JOCHEM, păt'êr yô'kêm. See HAS-PINGER, JOACHIM.

PATERNO, păt-êr'nô. A town in the Province of Catania, Sicily, situated on the south side of Mount Etna, 11 miles west-northwest of Catania (Map: Italy, E 6). On a height overlooking the city stands an ancient Norman castle, including a Norman tower and chapel with frescoes. There are mineral springs and a trade in wine, oil, and hemp. Paterno is built on the site of the old Greek city of Hybla Major. Pop. (commune), 1901, 23,453; 1911, 28,923.

PATERNO' DI SESSA, dê sês'sâ, EMANUELE (1847-). An Italian chemist. He was born at Palermo, where he graduated from the university in 1872 and where he was later, for a time, rector of the university. After 1889 he was a member of the national Senate, and afterwards resided at Rome, where he was also professor of chemistry in the university there. Paterno' wrote extensively on chemical subjects.

PATERNOSTER, păt'êr-nô's'têr or păt'êr- (Lat., Our Father). A name for the Lord's Prayer (q.v.) commonly used among Roman Catholics, from the opening words of the Latin version employed in all their services. In the rosary (q.v.) it is combined with the Hail Mary, the beads used for the Lord's Prayer, which are also called paternosters, being larger and sometimes made of different material.

PATERNOSTER ROW. A noted London street, long the focus of the publishing and book trade of the city. Its name is derived from the makers of rosaries and prayer books, who formerly made it their headquarters.

PATERSON. An important manufacturing city, the county seat of Passaic Co., N. J., 16 miles northwest of New York City, on the Passaic River, the Morris Canal, and the Erie, the Delaware, Lackawanna, and Western, and the New York, Susquehanna, and Western railroads (Map: New Jersey, D 2). Its area of 8½ square miles makes it one of the smallest of the densely populated cities of the United States. The city was founded primarily as an industrial centre through the activities of Alexander Hamilton. Hamilton was convinced that the United States would never be independent of Europe until it could manufacture within its own borders all the textiles needed for its own use. He therefore was instrumental in organizing the first great industrial corporation in America, the Society for the Establishing of Useful Manufactures, which received a charter from the State of New Jersey in 1791 and established the town site of Paterson in the vicinity of Passaic Falls for the purpose of using the water power. The Company was authorized to issue \$1,000,000 in capital stock. They established cotton mills, paper mills, and other manufactories and still maintain a large number of mills in Paterson and vicinity. Paterson became a township in

1831 and was made a city in 1851. Its government is of the commission form. The mayor is elected by the people and he appoints bipartisan commissions of four members each, consisting of board of finance, board of public works, board of fire and police commissioners, and larger boards of education, health, playground and recreation, parks, library, and the like. The board of finance is so organized that it has no power to spend money, that being delegated to the other boards, which in turn have no power to pay bills, that being the province of the board of finance. Paterson spends annually for municipal purposes \$1,575,120. The main items of expense are \$615,822 for schools, \$210,554 for the fire department, and \$207,000 for the police department. The assessed valuation in 1914 was \$106,000,000, the bonded indebtedness \$5,087,000, and the sinking fund \$1,149,936.

Paterson has 350 silk-manufacturing plants of all kinds, the silk mills being the most extensive in the United States. Other prominent industries are the manufacture of locomotives, shirts, machinery, paper boxes, twine, and thread, and the dyeing of silk and cotton. In 1909 there were 702 manufacturing establishments, representing an invested capital of \$66,402,000. The number of wage earners was 32,004 and the value of products \$69,584,000. The production of the silk industry was valued at \$40,358,000. The city is a large trading centre.

On account of the necessity of keeping the silk fabric clean while in process of making, none of the factories in the city use soft coal, and consequently Paterson has the aspect rather of a residential than of a manufacturing city. Its death rate of 11.43 is one of the lowest of the large cities in the United States. Paterson has two large and many small parks. The hills about the city make natural play and recreation grounds. The city is midway between the lake and seashore resorts of New Jersey. The fine roads from Paterson leading to Lake Hopatcong, Greenwood Lake, and other famous inland New Jersey watering places make driving and motoring one of the principal pleasures of the people. There are a number of fine clubhouses and institutional buildings, and the City Hall, County Court House, and Public Library are imposing buildings. The city's nine banks show resources of \$43,000,000 and the largest of the savings banks has deposits of \$14,500,000. Besides the many social and civic clubs Paterson has 250 fraternal, benevolent, and similar organizations. The steady growth of the city is indicated in the following statistics: Pop., 1850, 11,334; 1860, 19,586; 1870, 33,579; 1880, 51,031; 1890, 78,347; 1900, 105,171; 1910, 125,600; 1914 (U. S. est.), 134,305. In 1910 the population included 50,179 persons of foreign birth. Of these 9317 came from Italy, 6861 from Russia, and 5741 from Germany.

PATERSON, JAMES ALEXANDER (1851-). A Scottish Biblical scholar, born in Dalry, Galloway, where his father was a United Presbyterian minister. He was educated at Aberdeen University and at Pembroke College, Oxford. In 1876 he was made professor of Hebrew and Old Testament exegesis in the United Presbyterian College at Edinburgh and in 1900, upon the union of the Free church and United Presbyterian church, he became colleague (and then successor) of A. B. Davidson in New College. He edited Davidson's *Old Testament*

Prophecy (1904) and his other posthumous works and translated Hermann Schultz's *Old Testament Theology* (2d ed., 1898). Paterson wrote *The Period of the Judges* (1887) and commentaries on Leviticus (Temple Bible) and Numbers (Polychrome Bible).

PATERSON, JOHN (1744-1808). An American soldier, born at New Britain, Conn. He graduated at Yale in 1762, practiced law for a time in New Britain, removed to Lenox, Mass., in 1774, and was elected a member of the Massachusetts Provincial Congress. Immediately after the battle of Lexington he led a regiment of minutemen to Cambridge and helped to erect the first redoubt near Boston. He afterward served with great gallantry in the Canada and New Jersey campaigns in the operations against Burgoyne and became a brigadier general (1777) and a major general (1783). He held a command in the Massachusetts militia during Shays's Rebellion in 1786, and afterward (1794) removed to Lisle (now Whitney's Point), N. Y., and became county judge of Broome County. He served four terms in the State Legislature, was a member of the State Constitutional Convention in 1801, and was a member of Congress in 1803-05. From 1805 until his death (at Lisle) he devoted himself to farming. Consult Eggleston, *Life of Major-General John Paterson* (2d ed., New York, 1898).

PATERSON, ROBERT (1715-1801). A Scottish stonemason, born near Hawick, who is immortalized by Sir Walter Scott as Old Mortality. After his marriage he leased a quarry of his own, but, being a Cameronian (see CAMERONIANS) with the courage of his convictions, his house was burned and himself made prisoner by the Jacobites on their retreat from England with Prince Charles in 1745. Paterson began his wanderings by taking monuments into the Galloway district for the graves of the Covenanters, and from 1758 he forsook his wife and family in his enthusiasm for his self-appointed task. For more than 40 years he and his old white pony were well-known figures in the vicinity of every churchyard of southern Scotland where there were Cameronian monuments. Old Mortality restored their lettering and otherwise kept them in order. He depended for his living chiefly upon Cameronian hospitality, which never failed him, had ever a melancholy mania for discoursing upon the persecutions of the hillmen, and died in poverty.

PATERSON, WILLIAM (1658-1719). A British financier, born in Dumfriesshire, Scotland. When a young man he removed to England and then went to the Bahama Islands. Returning to London, he engaged in trade and soon acquired a considerable fortune. Paterson is chiefly famous for having been the originator of the Bank of England and for having projected the Darien scheme. His first overtures to the government for the establishment of the bank were made in 1691, but it was not until 1694 that Parliament adopted his plan and passed the Act creating for 10 years the corporation called the Governor and Company of the Bank of England. Paterson was one of the original stockholders and a director of the bank, but in less than a year he resigned and soon afterward took up the more visionary Darien scheme (q.v.). Removing to Edinburgh, he succeeded in persuading the Scottish Parliament to pass the Act of 1695, which created the Company of Scotland trading to Africa and India, under the management of which

the settlement at the Isthmus of Darien was made. Paterson, who had, because of a quarrel with the directors, accompanied the expedition merely as a private individual, lost his wife by death and suffered greatly from hardships and sickness. Upon his return to England he was an active and influential advocate of the union between Scotland and England and had a considerable share in framing the articles of the treaty relating to trade and finance. In consideration of his public services the united Parliament of 1708 recommended that he be given an indemnity for his losses in the Darien undertaking, but this was not done until 1715, when he received £18,241. Paterson published anonymously more than 20 works on finance, colonial enterprises, legislative union, and other subjects. His *Works* have been collected by Bannister in three volumes (London, 1859). Consult also Bannister, *Life of W. Paterson* (Edinburgh, 1858).

PATERSON, WILLIAM (1745-1806). An American statesman and jurist, born in Antrim, Ireland. He came to America when very young, graduated at the College of New Jersey (Princeton) in 1763, studied law, and was admitted to the bar in 1769. In 1776 he was a member of the Legislative Council of New Jersey and of the State Constitutional Convention. The same year he was elected Attorney-General and served until 1783, the close of the Revolution, when, finding that his duties could properly end, he resigned. He was a delegate to the Continental Congress in 1780-81 and in 1787 to the National Constitutional Convention. Here, as a representative of the smaller States, who feared to enter a union in which population or wealth should govern representation, he proposed (June 13) the famous "New Jersey plan." (See *NEW JERSEY, History*.) This provided for a single legislative house in which each State should have one vote, an Executive Council removable by Congress, and a supreme judiciary to be elected by Congress. The national government should have power to regulate commerce, levy import duties, and, if necessary, make requisitions for money upon the States. He was one of the first Senators from New Jersey in 1789, but resigned in 1790. From 1791 to 1793 he was Governor of the State, and the town of Paterson was named in his honor. In 1793 Washington appointed him an associate justice of the Supreme Court, on which he served until his death. A collection of his letters has been published under the title *Glimpses of Colonial Society and the Life at Princeton College, 1766-1773, by One of the Class of 1763*, edited by Mills (Philadelphia, 1903).

PATERSON, WILLIAM (1839-1914). A Canadian statesman. He was born at Hamilton, Ontario, and was educated in that city. After some years of business training he became a manufacturer in 1863. Entering municipal life, he served as mayor of Brantford (1872-73), after which he took an active part in Dominion politics and was a Liberal member of the House of Commons from 1873 until 1911. In 1896 he was appointed Controller of Customs in the Laurier administration and took a prominent part in framing the customs tariffs of 1897 and 1907. He was Minister of Customs (1897-1911) and on several occasions was acting Minister of Finance. In 1902 he was one of the Canadian delegates to the Imperial Colonial Conference, London, and in 1909 was appointed Royal Commissioner concerning improved trade relations

between Canada and the West Indies. With William Stevens Fielding (q.v.), Paterson conducted at Washington the Canadian side of the negotiations in the Taft-Fielding reciprocity agreement in 1911. In the same year he retired on the defeat of the Laurier administration.

PATERSON, WILLIAM ROMAINÉ (1871-). A British novelist, better known by his pseudonym, Benjamin Swift. He was born in Glasgow, studied a year at Lausanne, and graduated from Glasgow University. His books are: *Nancy Noon* (1896); *The Tormentor* (1897); *The Destroyer* (1898); *Siren City* (1899); *Dartnell* (1899); *Nude Souls* (1900); *The Eternal Conflict: An Essay* (1901); *Sardon* (1902); *In Piccadilly* (1903); *Gossip* (1905); *The Nemesis of Nations* (1907); *The Death Man* (1908); *The Old Dance Master* (1911); *Lady of the Night* (1913). Of these the earlier were overfanciful or consistently disagreeable in matter, and in manner imitations of Meredith, but with *Siren City* he struck an original note.

PATHANS, pā-thānz'. One of the names of the Afghan peoples of the borderland of Hindustan and Afghanistan. The Indian Pathans have been of considerable historical importance, and the less cultured tribes have at times fought desperately against the British. Consult: Bellet, *The Races of Afghanistan* (London, 1880) and *Inquiry into the Ethnography of Afghanistan* (ib., 1891); Oliver, *Across the Border, Pathan and Biloch* (ib., 1890).

PATHELIN, pāt'lān', **PATELIN**, or **MAÎTRE PATELIN**. A noted French farce, composed probably at Rouen about 1464. Pathelin is a tricky lawyer, whose dishonest shifts form the staple of the action. It was worked over in modern style by Brueys and Palaprat (1706) as *L'Avocat Patelin* and had great success and in 1872 by E. Fournier. From their dialogue comes the familiar phrase *Revenez à vos moutons*, used there to recall Pathelin to the sheep whose disappearance is under discussion. Consult Richard Holbrook, *Master Pierre Patelin* (Boston, 1914).

PATH-FINDER. A name given to Gen. John Charles Frémont (q.v.) on account of his success in exploring the passes of the Rocky Mountains.

PATHFINDER, THE. A novel by James Fenimore Cooper (1840). It is the third in the *Leatherstocking Series* and continues the career of Natty Bumppo under the name of the Pathfinder.

PATHOLOGICAL ANATOMY (from Gk. *πάθος*, *pathos*, disease + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The branch of anatomy which treats of organs, tissues, and cells as changed from the normal by disease. It is usually studied in connection with the causative disease, and therefore in this work the pathological changes occurring during a disease are described in the article which treats of that disease.

PATHOL'OGY (from Gk. *πάθος*, *pathos*, disease + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The study of disease as a province of scientific knowledge; pathological physiology. Disease is well defined as "the expression of the sum of abnormal cell activities." (Schmaus.) Such activity disturbs the regular cell life in one of three directions: nutrition, function, or multiplication. It is evident, then, that pathology is, equally with physiology, a department of biology.

Many theories of disease and its causation are found in the history of medicine. Greek physicians, even before Hippocrates (c.460-357 B.C.), spoke of humoral pathology. Corresponding to the four elements, earth, air, fire, and water, there existed, according to their theory, the four qualities, dry, cold, hot, and moist. These qualities with the four elements formed the four humors of the body, blood, phlegm, yellow bile, and black bile. Galen (130-c.201) elaborated and advanced the humoral pathology of Hippocrates. Health he conceived to be the due combination, or "crasis," of the four humors, while illness he considered was the result of a disturbance of this condition. During favorable progress of disease these humors underwent a change, or "coction," which was taken as a sign of returning health and as a preparation for the "crisis," when an expulsion of morbid matter occurred. The humoral pathology was long in vogue. Jacques Dubois (Sylvius) (1478-1535), Ambroise Paré (1510-90), and Boerhaave (1668-1738) championed a new pathology. Sylvius and later Boerhaave asserted that the iatrochemical "acidities" of the fluids played a most important rôle. They classified acid, saline, oleaginous, glutinous, alkaline, and mixed acidities, which were supposed to originate in the food and to be especially active in chronic diseases. Francis Glisson (1597-1677) advanced the theory of "irritability," attributing it to both solids and liquids, which was much improved and amplified by Albrecht von Haller (1708-77). Life itself was considered to be irritability. Friedrich Hoffman (1660-1742) originated the "solidist pathology." He asserted that disease was "a marked disturbance in the movements of the solids and the fluids." In these disturbances the solids are the active and the fluids are the passive agents. Excessive movement produces "spasm," and defective movement produces "atony." Disease, he admitted, "might be due to alteration in the humors, and especially to a gradual thickening of the vessels, which tends at once to hinder their free circulation and to prevent the excretion of waste products." His four main sources of disease were, therefore, spasm, atony, altered humors, and deficient excretion. Paul Joseph Barthez (1734-1806) launched the mystic and vague vitalistic pathology. He assumed the existence of a "vital principle," neither soul nor body. Disease he asserted to be the effort of the vital principle to resist harmful agencies, or to be due to "a morbid idea manifesting itself by alterations in sensibility, abnormal movements, or an aberration in those acts which regulate the chemical constitution of the humors."

It was reserved for Virchow (q.v.) in 1858 to enunciate clearly and elaborate convincingly the cellular pathology, now accepted the world over and forming the basis of a universal view of the organs and the diseases which affect them.

The complex human organism may be reduced to very simple elements, the cells and the intercellular substance to which they give origin. All parts of all organs and tissues are composed of cells or products of cells. Blood and lymph are tissues, differing from muscular or fibrous tissues in that they have fluid intercellular substance. Cells are the conductors of vital functions, normal or abnormal. Their condition changes with age, disease, and fatigue, on the one hand, and reparation and nutrition on the other.

Pathological conditions affect an organ in one

of two ways, as an increase or as a decrease in vital activity. Hence such conditions may be divided into two classes, the retrogressive and the progressive disorders. It is obvious that each of these processes involves functional as well as anatomical differences and abnormalities. Between the two processes seems to stand the condition of arrest of development, due to mechanical causes or to interrupted vascular supply. If development begins but is arrested, the condition is termed aplasia. If the arrest is partial, the condition is termed hypoplasia. If an organ is wholly undeveloped, the condition is termed agenesis.

The pathologist's attention is fixed largely upon the nature of anatomical changes found, and the explanation of their occurrence. These changes are termed lesions, and upon more or less accurate idea of their nature and extent depend the success of measures taken for the relief of disease. Having established a conception of the lesions present, the investigator turns to their cause. The inquiry as to causation is embraced in the branch of pathology termed etiology. This department includes not only the study of vegetable organisms (bacteria) and animal organisms (such as plasmodia) and mineral toxins and their agency in producing lesions, but also the study of reaction following the activity of the agent. This reaction depends in some measure upon the developmental disorder present, or the inherited dispositions of the tissues as to resistance or susceptibility. Inherited conditions are largely speculative and inferential, and this factor of etiology is of less importance in the analysis of disease. The essential feature of the whole matter is the adequate comprehension of the abnormal expression of cellular life. There are, then, three subdivisions of pathology: etiology, or the study of causes of disease; morbid anatomy, or the study of structural changes in disease; and morbid physiology, or the study of disturbances of function, including morbid chemical action.

Pathology naturally separates into two great divisions: (1) general pathology, or the study of morbid conditions which are common to several different diseases; (2) special pathology, or the study of individual diseases. To illustrate, fever is a morbid condition which enters into a number of diseases and therefore belongs to the realm of general pathology; while the study of the lesions of typhoid fever, an individual disease, belongs to special pathology. The study of the gross and microscopic anatomy of diseased tissues are termed respectively gross pathology and pathological histology.

General Pathology. Of prime importance to the pathologist is the study of disorders of circulation, whether (1) hyperæmia, arising from excess of supply or diminished escape of supply of blood; or (2) anæmia, a decrease of supply of arterial blood; or (3) hemorrhage (see BLEEDING); or (4) œdema (q.v.); or (5) thrombosis (q.v.), under which is to be considered embolism (q.v.), with consequent necrosis or relief by anastomosis.

Necrosis (q.v.) is a local death of tissue, due to circulatory disorder, thermic action, or inflammation. A regressive disorder of the life of cells in which there is diminished nutritive and functional derangement is degeneration, which appears in several forms. The degeneration may be parenchymatous (or albuminous), fatty, mucous, colloid, amyloid, hyaline, glyco-

genic, or hydropic, or may appear in the form of petrification or pigmentation. Some of these forms of degeneration are described in BRIGHT'S DISEASE. In some forms of degeneration products of imperfect metamorphosis accumulate within the cells. In others necrotic cells and tissue elements or foreign material collect between the cells. In still others there is a gradual degeneration of the cell elements and a deposition in their place of a new substance. Atrophy (q.v.), on the contrary, is essential loss of substance without deposit of pathological or foreign material. Each component part of the tissues shrinks in volume. Yet atrophy may be accompanied by deposits of various kinds and in such cases coexists with degeneration, as in arteriosclerosis (q.v.). Defective innervation, exhausting diseases, disuse, long-continued moderate pressure, or certain drugs may be the cause of atrophy in different tissues, and these causes must be weighed by the physicians in determining pathological conditions in the course of treatment of a diseased person.

Among the progressive processes, or those in which the vital activity of the organism is actually increased, the most important are the reproductive. Inherent in every cell is the tendency for reproduction. Stimulus of various kinds awakens this innate tendency, which results in production of new tissue of various forms. Closely allied to the reproductive energy are the stimulus and the power to repair, to replace lost parts. Should the process of rebuilding go on to an excess of mere replacement, or should regular physiological growth be excessive, and the result be an increase in size as well as an increase in number of the elements, the condition is termed hypertrophy (q.v.). The phenomena of irregular development are considered under MONSTROSITY. Under the influence of bacteria or chemical agents or unascertained causes, and accompanied by pronounced vascular disturbance, a certain progressive process results in inflammation (q.v.). Still another progressive process results in the formation of neoplasms, or new growths, constituted of tissues of a different kind from those adjacent and developing at their expense. Most of these formations are considered under TUMOR.

With this preliminary knowledge of the processes at work, it is usual, in taking up the study of special pathology, to consider first the diseases of the blood, next those of the lymphatic tissues, then those of the various systems with their organs—respiratory, gastrointestinal, urinary, and reproductive—and then the diseases of bones and of joints, of voluntary muscles, of the brain and its membranes, of the spinal cord and its membranes, and of the peripheral system of nerves.

To bacteria are ascribed the production of lesions, and they certainly influence chemical and physiological processes locally and systematically. To their agency are ascribed pneumonia, diphtheria, cholera, leprosy, bubonic plague (qq.v.), etc. Animal parasites also play an important rôle in the production of pathological conditions. Among them are the *Amœba coli*, the *Mamatozoon malariae*, etc. There are also parasitic worms which produce diseases, e.g., tapeworm, lumbricoid, filaria (qq.v.), etc.

Preëminent among the many phases of pathological investigation during the last few years are the behavior of the blood in its reaction to bacterial and other toxins (see IMMUNITY).

the relation of the ductless glands to the body metabolism in health and disease (see ORGANO-THERAPY; SECRETIONS, INTERNAL); and the identification of new microorganisms as causes of diseases hitherto only suspected to be of bacterial origin, e.g., infantile spinal paralysis, as well as the methods of transmission. The special pathology of the different diseases is considered under the proper title for each disease.

Consult: Green and Bosanquet, *Pathology and Morbid Anatomy* (London, 1905); H. G. Wells, *Chemical Pathology* (Philadelphia, 1907); T. J. Horder, *Clinical Pathology in Practice* (Oxford, 1911); Adami and McCrae, *A Textbook of Pathology* (2d ed., Philadelphia, 1914); Delafield and Prudden, *Pathological Anatomy and Histology* (10th ed., New York, 1914). See HISTOLOGY.

PATHOLOGY, MENTAL. See MENTAL PATHOLOGY; PSYCHOTHEAPEUTICS.

PATH'ROS. The Hebrew corruption of the Egyptian name for Upper Egypt, *Pa'to'rës*, literally "the South-land." It occurs in four passages of the Old Testament: Isa. xi. 11; Jer. xlii. 1-15; Ezek. xxix. 14, xxx. 14. The name was probably pronounced *Pathoris* by the Hebrews, as is indicated by the Greek rendering Παθόρης, and Φαθώρης. According to Cheyne (*Encyclopædia Biblica*, vol. iii), while the word means undoubtedly "Upper Egypt" as the passages now stand, it is much to be doubted if this was the meaning in the mind of the original writer. Since in Gen. x. 14 Pathrusim most probably is a distortion of *Sârêphâthim*, it is possible that Isa. xi. 11 is to be read "from Geshur and from Misrim," from *Zarephath*. The same change to Zarephath is most probable in the other references. In Assyrian it appears as *Paturisi*. The Pathrusim mentioned in Gen. x. 14 and 1 Chron. i. 12 belongs to the people of Pathros, or Upper Egypt. Consult Erman, in *Zeitschrift für die alttestamentliche Wissenschaft*, vol. x (Giessen, 1890), and *Encyclopædia Biblica* (London, 1902; see article "Pathros" by T. K. Cheyne).

PATIALA, püt'i-ä'lä. An eastern native state of the Punjab, India. Area, 3524 square miles. It has excellent timberland and produces grain, barley, wheat, maize, gold lace, iron and brass ware. Pop., 1901, 1,596,692; 1911, 1,407,659. Capital, Patiala.

PATIALA. The capital of a native Punjab state of the same name, India, 34 miles west of Ambala (Map: India, C 2). Pop., 1901, 53,545; 1911, 46,974. There are about 5000 Sikhs; the rest are almost equally divided between Hindus and Mohammedans.

PATIENCE. A comic opera, the music written by Sir Arthur Sullivan to the words of Sir W. S. Gilbert (qq.v.), first produced in London, April 25, 1881; in the United States, Sept. 22, 1881 (New York).

PATINIR, pá'té'nér', or **PATENIER**, -nyá', JOACHIM (c.1485-1524). A Flemish landscape and historical painter, born at Dinant. He was probably the pupil of Gerard David at Bruges. Afterward he lived in Antwerp, where Albrecht Dürer painted his portrait in 1521. He was the first of the Flemish painters to make figures subordinate to the landscape in his pictures. He had little knowledge of perspective, and the small figures he introduced are fantastically grouped. He painted with extreme detail. Among his best pictures are: "Baptism of Christ," Vienna Museum; "Temptation of St.

Anthony," Madrid Museum; "Repose in Egypt," New York Historical Society.

PATIÑO, pa-tē'nyó, José (1666-1736). A Spanish statesman, born at Milan (then a duchy belonging to the King of Spain), of a distinguished Gallegan family. In 1707 he was appointed to the Royal Council of Military Orders and became a knight of Alcántara with the intendancy of Estremadura. He served as intendant of Cataluña (1711-18) and was made intendant of the navy (1717), in which position he rapidly built up that newly organized branch of Spain's military establishment. The King appointed him (1726) Secretary of the Navy, of the Colonies, and of Foreign Affairs. To these heavy duties were added the War portfolio (1730) and the premiership (1734), so that during the last 10 years of his life the most important branches of the public service were concentrated in his hands. And yet these enormous duties did not seem to surpass his capacity for hard work, and in every one of these departments of public office he made important reforms.

Consult William Coxe, *Memoirs of the Kings of Spain of the House of Bourbon, 1700-1788*, vol. ii (London, 1815), and Antonio Rodríguez Villa, *Patiño y Campillo* (Madrid, 1882).

PATKUL, pät'kul, JOHANN REINHOLD VON (1660-1707). A Livonian nobleman, prominent as an opponent of the Swedish power during the last part of the seventeenth century and the beginning of the eighteenth. He was born at Stockholm, where his father was then a prisoner of state, and after receiving a military education entered the Swedish army (1687) and rose to the rank of captain. His bold advocacy of the rights of the Livonian nobility, which the Swedish crown had suppressed, gained him the hatred of Charles XI, who in 1694 condemned him to mutilation and the loss of his estates. Patkul escaped and, in 1698, took service with Augustus the Strong, Elector of Saxony and King of Poland, as a member of the Privy Council. He was instrumental in bringing about the alliance of Russia, Poland, Saxony, and Denmark against Charles XII in 1700, but soon after left the Saxon court and entered the service of Peter the Great. In 1704 he was Russian Ambassador at Warsaw, where his outspoken criticism of the conduct of Augustus led to his being imprisoned. In the Treaty of Altranstädt, concluded between Saxony and Sweden in 1706, Augustus promised to surrender Patkul to Charles XII, but privately gave orders to the commandant of the prison to connive at his escape. Before this could be effected, however, a Swedish detachment entered Warsaw and Patkul was delivered into their hands. At Kazimierz, near Posen, on Oct. 10, 1707, Patkul was broken on the wheel and quartered as a traitor to his country. Consult Sjögren, *J. R. v. Patkul* (Stockholm, 1882), and Buchholz, *Beiträge zur Lebensgeschichte J. R. Patkuls* (Leipzig, 1893).

PATMORE, COVENTRY KEARSEY DIGHTON (1823-96). An English poet, born at Woodford, Essex. His earliest publication was a volume of *Poems* (1844), praised by Bulwer and utterly condemned by *Blackwood's* in an unsparing review. He also contributed to various periodicals, in particular to the *North British* and the *Edinburgh*, critical articles, which, although marked by valuable detached observations, are unsatisfactory because of his failure to understand work other than his own. It was he who

asked Ruskin to send to the *Times* the latter's famous letter in defense of the Pre-Raphaelites, and he wrote for the *Germ* an essay on *Macbeth*, and verse, including *The Seasons*. However, he was not much concerned with the Pre-Raphaelite movement, and latterly at least held no complimentary opinion of Rossetti. He was at one time a disciple of Tennyson, and in 1850 recovered the manuscript of *In Memoriam* from a cupboard in which it had been left. From 1846 to 1866 he was assistant in the printed-book department of the British Museum. In 1804 he became a convert to Roman Catholicism. His published verse includes: *The Angel in the House* (in part, 1854; complete, 1863; later ed., 1905); *The Unknown Eros and Other Odes, i-æææi* (1877); and *Poems* (in a definitive edition, with a treatise on English metrical law, 1886; reprinted, 1890, 1894, 1897). Of these the more pretentious are in narrative form, quite lacking in any unity of interest, but with fine isolated passages, particularly descriptions of natural scenery, set in the mass of context. His triviality and baldness have been perhaps too monotonously dwelt upon by the critics, and the high esteem of eminent contemporaries is not wholly to be disregarded; but his work seems much less remarkable than his rugged and striking personality. Of his prose may be mentioned *Principles in Art* (1889; new revised and rearranged ed., 1898), essays reprinted from the *St. James's Gazette*, and *Religio Poetæ* (1893; revised and rearranged, 1898). He wrote, also, a memoir of the poet Procter, better known as Barry Cornwall (1877), and *Root, Root, and Flower* (1895), religious observations and meditations. There is an edition in his *Works* in five volumes (New York, 1907). Consult: Basil Champneys, *Memoirs and Correspondence of Coventry Patmore* (2 vols., London, 1900); E. W. Gosse, *Coventry Patmore* (New York, 1905); Paul Claudel, "Coventry Patmore," in *Etudes francoisaises*, vol. iii (Paris, 1914).

PATMOS (Lat., from Gk. Πάμος). An island in the Ægean Sea, one of the Sporades, about 28 miles south-southwest of Samos (Map: Greece, H 6). Area, about 15 square miles. The island is 10 miles long from north to south, and its greatest width is 6 miles. The most prominent physical feature of the island is its masses of volcanic hills, which rise 800 feet at their highest point. The island has borne no conspicuous part in history and owes its reputation to the reference made to it in the Bible (Rev. i. 9), where it is stated that Patmos was the place to which St. John was exiled and that there he received the visions contained in the Book of Revelation. The most important feature of modern Patmos is the monastery of St. John, founded in the eleventh century. Here was once gathered a very valuable library, many of the most important books in which have been sold. Under Turkish rule the condition of the island deteriorated. Patmos was taken by Italy in 1912 during the Turco-Italian War. In that year delegates from the Ægean islands met at Patmos and voted an address to the Italian government expressing their desire for union with Greece. Patmos remains (1915) under Italian rule. Pop., about 4000, mostly Greek.

PATNA, püt'ná. A native state of India, feudatory to Bengal. Area, 2399 square miles. Pop., 1901, 277,748. After having been for a number of years under British administra-

tion the state was restored to a dependant of its ancient Rajput rulers.

PATNA. A division of the Province of Behar and Orissa, Bengal (q.v.), British India, comprising the districts of Patna, Gaya, Shahabad, Saran, Champaran, Muzaffarpur, and Darbhanga. Area, 23,748 square miles. Pop., 1901, 15,614,987. The locality is watered by the Ganges and its tributary, the Son. The climate is extremely hot in summer and mild in winter. Rice, wheat, barley, and indigo are grown and the opium poppy is extensively raised. Capital, Patna (q.v.).

PATNA. The capital of a district and division of Behar and Orissa, British India, on the right bank of the Ganges, 332 miles northwest of Calcutta (Map: India, E 4). It covers a large area, stretching with its suburbs for 9 miles along the river bank; its streets are crooked and dirty and there are few interesting buildings. The Golah, a large, circular structure with walls more than 12 feet thick, originally built as a granary, is remarkable for its acoustic properties. The city has extensive bazars, contains the largest opium factories in India, has a large indigo trade, and after Calcutta is the most important city in Bengal. In the European quarter on the west are a Roman Catholic cathedral, Protestant churches, government offices, a government college, a school of engineering, the Nabob's palace, and the great tank.

Patna, under the former name of Palipatna, or Lotus City, is supposed to have been the capital of Behas as early as 419 B.C. Here at an early period the East India Company established factories and traded in opium, rice, etc. In 1763 disputes about transit duties arose between the company's servants and the native government. A war ensued, resulting in a massacre and British occupation of the district. Patna was the headquarters of the Wahabi or Mussulman conspiracy in 1864. It lies on the principal railroad of the Ganges valley, and also has considerable shipping on the river. Pop., 1901, 134,785; 1911, 136,153, most of whom were Hindus, with about 40,000 Mohammedans and 500 Christians.

PATON, JOHN BROWN (1830-1911). A British Congregational minister, born at Gals-ton, Ayrshire. He studied at Spring Hill College, Birmingham (succeeded by Mansfield College, Oxford), and graduated from London University (B.A., 1849; M.A., 1854). In the latter year he took up ministerial work in Sheffield. When Cavendish College at Manchester was opened in 1861 Dr. Paton became connected with it, and on the removal of the institution to Nottingham (1863) as the Congregational Institute, he accepted the principalship. He retired in 1898. His publications include: *The Origin of the Priesthood in the Christian Church* (1877); *Christianity and the Wellbeing of the People* (1885; 2d ed., 1900); *The Two-fold Alternative* (1889; 4th ed., 1909); *Present Remedies for Unemployment* (1909).

PATON, JOHN GIBSON (1824-1907). A British missionary, born near Dumfries, Scotland. "The Cotter's Saturday Night" illustrates well his early home life. Self-support devolving on him before he was 12 years old, he persisted, despite many hardships, in earning his way through school, college, and divinity hall. In 1858 he sailed for the New Hebrides with his devoted wife, who died, with their only child, in

the following year. On the island of Tanna, inhabited by cannibals, he had a long and desperate struggle to plant the gospel. An indomitable energy was Paton's inheritance from Covenanters forefathers; his escapes from death were many and often marvelous. Better success attended his efforts on the neighboring island of Aniwa, which was entirely won to Christianity, but the whole cluster of islands was occupied by churches within Paton's lifetime. Meanwhile he repeatedly visited Australia with its sister colonies, and also the homeland, securing thousands of pounds for three successive missionary ships which plied among the New Hebrides. An apostolic fervor of spirit drew men enthusiastically to his support. In 1864 he was married to Margaret Whitecross, who was thereafter an ideal companion of his life and labors. It was in 1885 that he yielded reluctantly to the importunities of his youngest brother and consented to write out the story of his life. Hastily penned amidst engrossing duties in the southern islands and dispatched in fragments to his brother, this autobiography was carefully edited by the latter and published in two volumes in 1889, taking at once the place it has retained ever since in the first rank among intimate human documents. In 1892 Dr. Paton came to the United States, where he pleaded before vast audiences for a reversal of the national policy that tolerated the liquor traffic and the trade in firearms among the Melanesians. Victory in both these campaigns, though not immediate, cheered the veteran missionary some years before his death. Consult, besides the *Autobiography*, Margaret Whitecross Paton, *Letters and Sketches from the New Hebrides* (New York, 1895), and James Paton, *John G. Paton: Later Years and Farewell* (ib., 1911).

PATON, SIR JOSEPH NOEL (1821-1901). A Scottish historical painter. He was born at Dunfermline, Scotland, and studied for a short time at the Royal Academy Schools, but was mainly self-taught. He received two prizes in the Westminster Hall competition (1845, 1847), and became a member of the Royal Scottish Academy in 1850. In 1866 he was appointed Queen's limner for Scotland and in 1867 he was knighted. Paton made the cartoons for the glass of the great windows of Dunfermline, restored in 1884 by Andrew Carnegie. His subjects are drawn from fairy tales, history, poetry, and religious lore, but his interest in them was literary and sentimental rather than pictorial, and though exceedingly popular in his own day and displaying fertile invention and deft and accurate technique, his paintings are deficient in design and handling and harsh in color. His chief works include: "The Spirit of Religion" (1845); "The Quarrel of Oberon and Titania" (1846) and "The Reconciliation of Oberon and Titania" (1847), both in the National Gallery, Edinburgh; "Home from the Crimea" (1856); "Luther at Erfurt" (1861).

PATON, LEWIS BAYLES (1864-). An American theologian. He was born in New York City, graduated from New York University in 1884 and from Princeton Theological Seminary in 1890, and studied at Berlin (1890-92) and at Marburg (Ph.D., 1897). In 1890 he was ordained to the Presbyterian ministry, two years later becoming a Congregationalist. At Hartford Theological Seminary Paton was instructor in Old Testament exegesis and criticism in 1892-93, associate professor from 1893 to

1900, and thereafter Nettleton professor. In 1903-04 he directed the American School of Oriental Study and Research in Palestine. Besides editing *Recent Christian Progress* (1909) he is author of *The Early History of Syria and Palestine* (1901); *Jerusalem in Bible Times* (1908); *The Early Religion of Israel* (1910).

PATOS, pã'tosh, LAGOA DOS. A lake in Brazil. See LAGOA DOS PATOS.

PATRAS, pã'trás, or **PATRÆ**. A fortified seaport of Greece and the capital of the Nomarchy of Achaia, situated in a fertile plain on the Gulf of Patras (Map: Greece, C 5). The town is dominated by a citadel-crowned ridge, the site of the ancient acropolis. It was rebuilt, after Greece had acquired its independence in the nineteenth century, with wide and straight streets, and has a fine church and post office, a high school, and ruins from ancient Greek and Roman times. The harbor is only a roadstead, protected by a breakwater, but the town is, nevertheless, an important trade centre and the seat of a United States consul. The chief exports are currants, wine, oils, valonia, and skins. Pop., 1889, 33,529; 1907, 37,724. Patras was one of the foremost among the twelve cities of Achaia. At the time of the Slav invasion of the Balkans many Greeks sought refuge within its walls. During the Middle Ages it became the chief commercial city of the Peloponnesus. It was the first Greek city to revolt against the power of the Turks, by whom it was destroyed in 1821.

PATRES CONSCRIPTI. See CONSCRIPT FATHERS.

PATRIA POTESTAS (Lat., paternal power). The power of the father over his children in early Roman law was similar to that which existed among other Aryan peoples at the same stage of social development. (See PARENT AND CHILD.) What was peculiar in later Roman law was the extent to which this early power was maintained even at an advanced stage of civilization, and the duration of the power, in the case of sons, until the father's death. Daughters passed out of the paternal power upon marriage, but sons remained subject even after their marriage. The son had no *potestas* over his children until his father's death. *Patria potestas* was thus the authority not merely of the father over children, but of the paternal ancestor over all descendants in the male line (son's children, son's son's children, etc.).

In early Roman law the father had an unlimited right to expose to death all infant daughters except the first-born. Sons and first-born daughters might also be exposed if they were deformed and the deformity were attested by five of the nearest neighbors. The father had also, as domestic magistrate, the right to punish his children, even with death, after a trial at which the kinsmen were present. These paternal rights existed throughout the Republican period, unchecked except by the arbitrary power of the censors and of the popular assembly to punish abuses of paternal power. In the Imperial period, however, exposure of children was forbidden and the right of punishment was reduced within reasonable disciplinary limits.

The father had also the right to sell the child. Sale into slavery was unusual; in the later Empire it was permitted only in the case of new-born children and only when the father was in extreme poverty, and even then he retained the right of ransom. To pledge the person of

a child for the father's debt (which was originally accomplished by sale with the right of ransom) was not uncommon, nor was this practice forbidden until the Imperial period. It was also not unusual for a father to sell his son's services for a number of years. A so-called royal law (i.e., a rule of the old religious law; see CIVIL LAW) forbade the sale of a married son; and another royal law declared that a son sold three times should be free from the father—a rule of which the jurists took advantage in devising a form of emancipation (q.v.). Sales of children for the purposes of emancipation or of adoption into a new family, and sales of daughters as a method of giving them in marriage, were of course purely formal.

Sons and daughters and their children under *patria potestas* had no property of their own; whatever they acquired was acquired for the head of the house. In the Imperial period, however, the son and also the daughter obtained property rights.

With the development of the legal recognition of the child's right to life came the recognition of his right to support. With the development of independent property rights of the child came the duty to support an indigent parent.

Even at early Roman law there was one field in which sons were independent, viz., that of public law. The son under paternal authority had political rights and was eligible to office, and, if clothed with official power, he could control the actions of the father.

Paternal authority existed only over children born to the father in lawful marriage. In the later Empire children born of a concubine (*fili naturales*) could be legitimized by the subsequent marriage of their parents or by rescript of the Emperor. Children thus legitimized and children brought into the family by adoption (see ADOPTION) were subject to *patria potestas*.

Patria potestas was extinguished not only by the death of the father, but also by his loss of liberty or citizenship. His capture and enslavement by foreign enemies, however, only suspended his paternal authority, and if he escaped or was ransomed it revived. The practical meaning of the rule was that condemnation to any penalty which carried with it loss of freedom or of citizenship destroyed *patria potestas*. Forfeiture of paternal authority was also imposed, by Imperial legislation, on the father who exposed his child or prostituted his daughter. The marriage of a daughter extinguished her father's authority as long as marriage carried the woman into the power (*manus*) of her husband, but when the free marriage was developed the married woman remained under her father's authority. Even in such a marriage, however, her children were under the paternal authority of her husband or of her husband's father. Paternal authority was extinguished, in the older Roman law, when a son became a flamen of Jupiter or a daughter became a vestal virgin. In the law of Justinian the same result attached to the elevation of the son to the episcopate or his appointment to any important secular office. Finally, paternal authority was extinguished when the son or daughter was voluntarily emancipated or transferred to an adopted father. The emancipation of children originally deprived them of all right of inheriting property in their original family except by testament; but this result was obviated, as regarded the father's estate, by the prætorian edict, and, as regarded the estates of brothers,

sisters, and paternal relatives, by Imperial legislation. See EMANCIPATION; FAMILY; MANUMISSION; SLAVERY; and consult the authorities referred to under CIVIL LAW.

PATRIARCH (Lat. *patriarcha*, *patriarches*, from Gk. *πατριάρχης*, patriarch, chief of a tribe, from *πατρία*, *patria*, lineage, from *πάτρις*, *pater*, father + *ἀρχεῖν*, *archein*, to rule). 1 The head or ruler of a family; used especially of the Hebrew ancestors, Abraham, Isaac, Jacob, and the sons of Jacob, and of the names of the progenitors of the race as given in the antediluvian period of the Biblical narrative. See METHUSELAH.

2. In the history of the Christian Church the title is applied to the bishops of certain great metropolitan sees of a wider jurisdiction than other metropolitans. The three earliest instances seem to be directly connected with a tradition of the establishment of those sees by St Peter. These are the three which the First Council of Nicaea asserts to be recognized by ancient custom—Rome, Antioch, and Alexandria. After the translation of the seat of empire to Byzantium, thenceforward called Constantinople, that see, which had originally been subject to the Metropolitan of Heraclea, obtained first metropolitan and then patriarchal rank, and eventually established a precedence over Antioch and Alexandria, being ranked second only to Rome. To these four patriarchates was added in 451 that of Jerusalem, which was formed by the Council of Chalcedon out of the ancient patriarchate of Antioch. The limits of these five patriarchates can only be loosely assigned. These patriarchs had authority to consecrate the metropolitans under their jurisdiction and to preside over councils and high judicial tribunals within the same limits. After the Greek schism, and particularly after the establishment of the Latin Kingdom of Jerusalem, Latin prelates were appointed with the rank and title of patriarch in each of the four great Eastern sees. Since then there have been a number of patriarchs in the East—among the Greek Orthodox (one for Russia, created in 1589 and removed by Peter the Great), among the Nestorian, Jacobite, Armenian, and Coptic communities, and among those who have returned to union with Rome.

Besides the five greater patriarchates there have been others in the West known by the name of minor patriarchates. The controversy of the Three Chapters (see CHAPTERS, THE THREE) gave the Bishop of Aquileia an opportunity to assume this title, whereupon the orthodox Bishop of Grado asserted an equal right to it. It remained in the former line even after the first bearer made his submission, until Benedict XIV abolished it; that of Grado was transferred to Venice in 1451. In France the Bishop of Bourges at times claimed the title, and Napoleon had the idea of creating a French patriarch. Pope Paul III granted the dignity of Patriarch of the Indies to the grand chaplain of the King of Spain, and the King of Portugal asked a similar dignity for his grand chaplain, with his see in Lisbon. As a matter of fact, by the Concordat of 1886, which regulated the relations between church and state in the Portuguese East Indies, the honorary title was conceded to the Archbishop of Goa. For the Eastern patriarchate, consult K. Lübeck, *Reichseintheilung und kirchliche Hierarchie des Orients* (Münster, 1901).

PATRIARCHAL CROSS. A cross which, like the patriarchal crossier, has its upright part

crossed by two horizontal bars, the upper shorter than the lower.

PATRIARCH'ATE. 1. The rule or jurisdiction of a father. 2. Any social group, as a family, a clan, or a tribe, living under the rule of a father or eldest male member of the group. The term stands for an important stage in the development of human society and for an important theory commonly called the patriarchal theory. In nomadic communities, and often in simple agricultural populations, there are found compound families, in which two or three generations of relatives, including many brethren with their wives and children, live together under the rule of the eldest male and in the common ownership of a household property. The society of the ancient Hebrews in the very early days is described in the Old Testament as patriarchal. The nomadic tribes of the Arabian desert and of the steppes of Central Asia are patriarchal now. The family and clan organization of the ancient Greeks and of the ancient Romans was patriarchal and a large proportion of the Slavic population of Russia and of southeastern Austria is patriarchal still. In its simplest form the patriarchal theory is stated by Aristotle in the opening pages of *The Politics*. Society is represented as springing from a single family, consisting of a man and his wife and children. The children and children's children continue to live with the first father, acknowledging him as chief or patriarch as long as he lives. On his death his descendants divide into as many families as he has sons with offspring. Each such son becomes the patriarch of a new compound family. In the course of time many such related families, living in one district and speaking one tongue, become a tribe. Tribes enlarging divide, but if they do not separate too far they presently confederate and become a nation. This simple theory underwent great modification through the researches of Sir Henry Sumner Maine, who in *Ancient Law* (London, 1861, new ed., New York, 1907) showed that the patriarchal family of the Romans was a partly natural, partly artificial group held together by the supreme power (*potestas*) of the eldest male. Membership in the group might be acquired through adoption as well as by actual descent from the first father, and it could not be acquired through blood relationship on the side of the mother. Neither males nor females not subject to the father's power were accounted as of the group, and property descended only through kinship in the male line. The group was thus essentially not a compound family, but, rather, a clan or gens (See GENS). Maine attempted to prove in this work, and later in *Early Law and Custom* (London, 1891), that this highly artificial patriarchal system had been general among Aryan peoples. A destructive criticism of Maine's theories by John F. McLennan, *The Patriarchal Theory*, edited and completed by Donald McLennan, was put forth (London) in 1885. In this work it was shown that the patriarchal family has everywhere been preceded by the clan and family system based on kinship through females, and that the true *patria potestas* has been of exceptional occurrence, even after the patriarchal system has been established. Substantially the same conclusions are maintained by W. Robertson Smith, *Kinship and Marriage in Early Arabia* (London, 1885; new ed., 1903). An exceedingly interesting and instructive account of the economic aspect of

patriarchal institutions, especially in Slavic communities, is found in E. de Laveleye, *De la propriété et de ses formes primitives* (Paris, 1874; Eng. trans. by G. R. L. Marriott under title of *Primitive Property*, London, 1878). The most satisfactory treatment of the patriarchal theory in the light of recent research and with reference to C. N. Starcke, *The Primitive Family* (New York, 1899), and E. A. Westermarck, *The History of Human Marriage* (London, 1891; new ed., New York, 1912), is found in G. E. Howard, *A History of Matrimonial Institutions*, part i of vol. i (Chicago, 1904). See MARRIAGE; MATRIARCHATE.

PATRIARCHS, TESTAMENTS OF THE. See APOCRYPHA, *Old Testament*.

PATRIARCHS, TESTAMENTS OF THE TWELVE. See APOCRYPHA, *Old Testament*; APOCALYPTIC LITERATURE.

PATRICIAN, pà-trish'an (Fr. *patricien*, from Lat. *patricius*, of the rank or dignity of the fathers, from *pater*, Gk. *πάτερ*, *patēr*; connected with Goth. *fadar*, OHG. *fatar*, Ger *Vater*, AS. *fæder*, Eng. *father*). A name given to the members of the original Roman *gentes* (see GENS), of whom the *populus Romanus* consisted, and to their descendants by blood and adoption. The patricians were thus those who could point to definite fathers or forebears, i.e., those of blood and consequent social and political standing. The amalgamation of the three tribes of Ramnes, Tities, and Luceres gave rise to a distinction between *patres majorum gentium* and *patres minorum gentium*, the latter term being applied to clans recently elevated to an equality with the old patrician class. A recent theory makes the patricians originally a Sabine race that conquered a Ligurian people established on the site of Rome; by this theory the plebeians were survivors of the conquered Ligurians, with a family organization less highly developed than that of the conquering Sabines. On the establishment of the plebeians as a distinct order, sharing certain rights with the patricians, the patriciate became an aristocracy of birth, in the exclusive possession of a number of important privileges. A long struggle between the two orders ended in the attainment by the plebeians of a political equality and the establishment of a new aristocracy of *nobiles* based on wealth and office. From 300 B.C. the old political distinction between patricians and plebeians had no real existence, except that patricians were ineligible to the tribunate of the plebs. The Empire made an end even of this relic of earlier days. Under Constantine the dignity of *patricius* became a personal title, not hereditary, but conferring very high honor and certain privileges. It was created at Constantinople, and not confined to Romans or subjects of the Empire, but sometimes bestowed on foreign princes. These patricians, unlike the old Roman order, were distinguished in dress and equipage from the ordinary citizens. The popes in after times conferred the same title on eminent persons and princes, including many of the German emperors. In several of the Germanic kingdoms the title of patrician was bestowed on distinguished subjects, and in some parts of Italy the hereditary nobility are still styled patricians. Consult: For discussion of various views of the origin of the patricians and the plebeians, G. W. Botsford, *The Roman Assemblies* (New York, 1909). For the mediæval patriciate, J. B. Bury, *Later Roman Empire* (London, 1899); Bryce, *Holy Roman*

Empire (new ed., New York, 1911). For the patriciate in German territory, Foltz, *Beiträge zur Geschichte des Patriciats in den deutschen Städten* (Marburg, 1899). See PLEBEIANS; ROME.

PATRICK, ALBERT T. (?-). An American lawyer, born in Texas. After a sensational trial of more than nine weeks he was convicted on March 26, 1902, of instigating the murder (Sept. 24, 1900) of William Marsh Rice (q.v.), an aged New York millionaire. It was charged that Patrick sought to gain control of Rice's property by means of a forged will. On April 7, 1902, he was sentenced to die. The electrocution was to have taken place in the following month, but by an extraordinary series of delays and appeals, managed largely by Patrick himself, he was still alive in December, 1906. At this time his sentence was commuted by Governor Higgins to life imprisonment and in 1912 he was pardoned by Governor Dix. Two years later it became known that more than \$162,000 had been spent by Patrick and his friends during his long fight. His wife never ceased in her efforts to save his life and then to secure his pardon.

PATRICK, MARY MILLS (1850-). An American college president, born at Canterbury, N. H. She studied at Lyons College, Iowa, in 1866-69 and received the degree of A.M. from the State University of Iowa in 1890. In the latter year she became president of the American College for Girls in Constantinople. Between 1892 and 1897, when she took her Ph.D. at Bern, she spent several years in Europe on leave, studying at various universities. She was a member of psychological congresses at Munich (1896) and Paris (1900) and of philosophical congresses at Paris (1900) and Bologna (1911). Miss Patrick is author of an *Armenian Translation of a Text-Book of Physiology* (1876); *Seatus Empiricus and Greek Skepticism* (1889); *Sappho and the Island of Lesbos* (1912).

PATRICK, SAINT (†389-461). The apostle of Ireland. The known facts of his life are so meagre and so surrounded by legend that nearly every event from his birth to his burial has received various interpretations. His father was named Calpornius, a Briton, a deacon, and the son of a presbyter, evidently a man of some property, as his office of decurion, or member of municipal council, indicates. Patrick was born in Banneventa, the locality of which has been disputed. Tradition placed it at Dunbarton, Scotland, but it was more probably in southwestern Britain, not far from the Irish Channel. His British name was Succat, but perhaps from childhood he bore also the Roman name Patricius. When 16 he was taken captive in an Irish raid on Britain and carried to Ireland. In his autobiography he says that his master lived "nigh to the western sea," which would place the location of his service in the Kingdom of Connaught. Later tradition placed it in northern Dalaradia, near Mount Miss, the modern Slemish, in County Antrim, where he is said to have served a master named Milucc. After six years of slavery, impelled, he says, by visions, he escaped and, after some difficulty, gained an opportunity to work his passage to the Continent. After a voyage of three days he and his fellow voyagers landed on a coast which must have been western France, though he does not name it. Thence they traveled 38 days before they came to human habitations. They suffered

much from hunger, and again visions came to Patrick. This strangely desolate land may have been southwestern Gaul, lately devastated by the Vandals, who had passed thence into Spain. At length Patrick separated from the rough pagan sailors and found a refuge in the island monastery of Lérins, off the coast of Provence. Here he remained for a few years, but did not become a monk. At this point also later tradition varies and places his sojourn with the famous Martin of Tours (q.v.), who some accounts even state was his mother's brother. He returned home and was joyfully received by his family, but soon a vision came again, this time calling him to preach the gospel in the land of his captivity. He regarded the dream, which doubtless reflected his own meditations, as the voice of God, went to Autissiodorum (Auxerre) in Gaul for further preparation, and was shortly after ordained deacon by the Bishop, Amator. It was at least 14 years before he went to Ireland, though the cause of this long delay is not known. At last, in 432, he was consecrated Bishop of Ireland, upon the death of the former Bishop, Palladius, and went to his long-desired missionary field with the prestige of authority and office. The Christian communities were doubtless near the western and southern coasts, but Patrick had no intention of confining his work to the communities already Christian. His mission was to convert the pagans of Ireland, and he labored in various parts of the island. He probably landed near Wicklow, but tradition laid his first extensive labors in southern Dalaradia, in County Down, on the shores of Lake Strangford. Ireland was divided into petty kingdoms, with Loigaire in the position of high king, having a measure of authority over the other kings, and Patrick soon came into relations with him at Tara, his capital. The king did not become a Christian, but his brother, Conall, was converted and, in spite of vigorous Druid opposition, Patrick gained royal protection and favor. He is said to have founded many churches in County Meath. Thence he went into Ulster, and thence journeyed into Connaught, perhaps on three occasions. Tradition connects him with churches in Trim, Dunshaughlin, Uisnech, Donaghpatrick, Aghamagh, Shancough, Tannach, Caiselire, and Crosspatrick. About 441-443 he went to Rome, where he secured the approval of Pope Leo the Great. In 444 he founded Armagh and made it the ecclesiastical centre of Ireland. Traces of his work in south-Ireland are less clear, though tradition claims some work in Leinster and Munster. In his old age he was the subject of bitter and unjust criticism and, it would seem, retired from the headship of the church some years before his death. He died at Saul in Dalaradia, the scene of his earlier labors, near the mouth of the river Slaney, in County Down. The church at Armagh long possessed two relics claimed to be his—a crosier, destroyed in the Reformation, and a four-sided iron bell, now in the National Museum at Dublin.

Tradition has embellished his story with many legends: he drove the snakes out of Ireland; he brought darkness upon his enemies; he overcame Druid sorceries by miracles; after his death there was no night for 12 days, and his body diffused sweet odors. Patrick was rightly venerated as the greatest missionary to Ireland, but to say that he "found no Christians in Ireland and left no heathen" is to err in both parts

of the statement. There were Christians before and pagans after him, but his work insured the speedy and complete triumph of Christianity over the Druid religion.

Patrick was emphatically a man of deeds and not of words, and so his literary remains are few, though of great interest. First is his autobiography, which he calls his *Confession*. This was written in Latin, in which tongue he had become very rusty. Next comes his epistle to Coroticus, a Welsh prince, who had taken captive some of the Irish Christians. Patrick wrote to secure, if possible, their release. Finally, a hymn in Irish, called the *Lorica*, which is a confession of faith, may possibly be his work. Other remains bearing his name have not such good claim to be called genuine. All his remains, genuine and disputed, are in Migne, *Patrologia Latina*, liii; also in better shape with the *Tripartite Life*, one of the sources of his biography, in the "Roll Series," No. 89, two parts, edited by Whitley Stokes (London, 1887). For English translations of his genuine works and notes, consult: T. Olden, *Epistles and Hymns of St. Patrick* (Dublin, 1876; 3d ed., 1895); C. H. II. Wright, *The Writings of Patrick, the Apostle of Ireland* (London, 1889; new ed., 1909); N. J. D. White, "The Writings of St. Patrick," in *Proceedings of the Royal Irish Academy* (Dublin, 1904). For his life, consult: J. H. Todd, *St. Patrick, the Apostle of Ireland* (Dublin, 1861); Miss Cusack, *Life of St. Patrick, Apostle of Ireland* (London, 1871, with a translation of the *Tripartite Life* from the original Irish by W. M. Hennessey); J. F. Shearman, *Loca Patriciana: An Identification of Localities Chiefly in Leinster Visited by St. Patrick* (Dublin, 1882); W. B. Morris, *Ireland and St. Patrick* (London, 1888); E. J. Newell, *St. Patrick, His Life and Teaching* (ib., 1890); John Healy, *The Life and Writings of St. Patrick* (Dublin, 1905); J. B. Bury, *Life of St. Patrick and his Place in History* (London, 1905).

PATRICK, SAINT, ORDER OF. See SAINT PATRICK, MOST ILLUSTRIOUS ORDER OF.

PATRICK, SIMON (1626-1707). A Church of England divine. He was born at Gainsborough, Lincolnshire, and graduated from Queens' College, Cambridge, in 1648. He took orders and in 1655 was received as chaplain into the family of Sir Walter St. John, of Battersea. In 1662 he was appointed rector of St. Paul's, Covent Garden, London, and endeared himself to his people by faithful instructions and especially by remaining with them during the plague of 1665. In 1671 he was made chaplain in ordinary to the King. In 1672 he was made prebendary of Westminster and in 1679 dean of Peterborough. During the reign of James II he defended the Reformation. In 1689 he was made Bishop of Chichester and in 1691 transferred to the see of Ely. In his early life he wrote against the Nonconformists, in a pamphlet entitled *A Friendly Debate between a Conformist and a Non-Conformist* (1669), but after he became Bishop he changed his opinion, regarded them with favor, and used his influence to allay strife. He stood next to Tillotson in learning and influence. Among his numerous works were: *Mensa Mystica, or A Discourse Concerning the Sacrament of the Lord's Supper* (1680); *The Heart's Ease, or a Remedy against Trouble* (1660); *The Parable of the Pilgrim* (1664); *The Christian Sacrifice* (1671); *The Dignity of the Christian Priesthood* (1704). His para-

phrases upon the books of the Old Testament from Genesis to Solomon's Song were published in 10 volumes between 1695 and 1710. They are included with the commentaries of Lowth, Arnold, Whitby, and Lowman, in *A Critical Commentary and Paraphrase on the Old and New Testament and the Apocrypha* (London, 1809). A complete edition of his works was published in 1858 by the Rev. Alexander Taylor, in nine volumes. His *Autobiography* was published at Oxford in 1839. A *Memoir* by T. Chamberlayne was published with *The Parable of the Pilgrim* (London, 1839).

PATRIOFELIS (Neo-Lat., from Lat. *patrus*, relating to a father, hereditary, ancient + *felis*, cat). A fossil creodont mammal found in the Middle Eocene (Bridger) beds of Wyoming and of interest because it is considered by some authors to be the ancestor of the modern seals. Other writers, basing their conclusions on more recent examination of the material, consider *Patriofelis* to have been a terrestrial creodont with habits similar to those of the cats and presenting a lateral line of evolution that seems to have no descendants among modern carnivores. The animal, as indicated by the finely mounted skeleton in the American Museum of Natural History, was of heavy build, about 6 feet in length, with low, crouching attitude, flexed limbs, and long tail. The skull is rather large, with small brain case and a prominent posterior crest. The powerful jaws are armed with sharp cutting teeth. The feet are digitigrade, with spreading clawed toes. *Oxyæna*, from the Wasatch Lower Eocene beds, is a more slender, less specialized ally of *Patriofelis*. Consult Wortman, "Osteology of *Patriofelis*, a Middle-Eocene Creodont," in *Bulletin of the American Museum of Natural History*, vol. vi (New York, 1894), and H. F. Osborn, "Oxyæna and *Patriofelis* Re-Studied as Terrestrial Creodonts," in *Bulletin of the American Museum of Natural History*, vol. xiii (ib., 1900).

PATRIOTIC SECRET SOCIETIES. See SECRET SOCIETIES.

PATRIOTIC SOCIETIES (ML. *patrioticus*, from Gk. πατριώτικος, *patriōtikos*, relating to descent or to a fellow countryman, from πατριώτης, *patriōtēs*, fellow countryman, from πατρία, *patria*, race, country, from πατήρ, *patēr*, father). Societies having as their objects the preservation of the records of important events in history and especially of the wars in which the United States has participated, the encouragement of love of country, the saving and restoration of historical sites and objects, the celebration of anniversaries of historic events, and the fostering of fraternal feeling and intercourse among veterans.

Of the Colonial period, the earliest of the hereditary patriotic bodies is the Society of Mayflower Descendants. (See MAYFLOWER DESCENDANTS, SOCIETY OF.) Similar to this is The Society of the Ark and the Dove, which admits to membership lineal descendants who came over either in the *Ark* or the *Dove* under Governor Calvert in 1633 and settled in Maryland. The Society of Colonial Wars admits to membership adult male descendants of Colonial ancestors of distinction. (See COLONIAL WARS, SOCIETY OF.) Similar to the foregoing is the Order of the Founders and Patriots of America. Besides Colonial ancestry, it requires that its members shall be descended from ancestors who were loyal to the Colonies during the War of the

Revolution. (See FOUNDERS AND PATRIOTS OF AMERICA, ORDER OF.) Of like character is the Settlers and Defenders of America (q.v.), which admits both men and women. The first patriotic hereditary society of women to be organized was the Society of Colonial Dames of America. It admits on invitation women who are directly descended from some ancestor of worthy life who resided in an American Colony before 1776. (See COLONIAL DAMES OF AMERICA, SOCIETY OF.) Broader in its scope is the National Society of Colonial Dames of America. It admits on invitation women who are descended from an ancestor of worthy life who resided in an American Colony prior to 1750. (See COLONIAL DAMES OF AMERICA, NATIONAL SOCIETY OF.) The Society of Daughters and Patriots of America admits to membership by invitation women who are descended in the direct paternal line of either father or mother from an ancestor who settled in the Colonies before 1687, and of an ancestor in the same line who was loyal to the Colonies during the War of the Revolution. The Order of Washington, which was organized on May 13, 1908, as an order of patriotism and chivalry, admits to membership descendants of ancestors who arrived in America prior to 1750 and who were landowners or who held some official military, naval, or ministerial office. In New York City there is the Holland Society (q.v.), which admits to membership male descendants in the direct male line of a man of Dutch blood resident in America before 1675.

Commemorating the period of the great struggle between the Colonies and Great Britain are a number of hereditary societies, of which the oldest and best known is the Society of the Cincinnati (q.v.), which admits to membership descendants of officers who served in the Continental army for at least three years. Following the centennial celebration of the battle of Lexington, there was organized in San Francisco, Cal., on Oct. 22, 1875, the Sons of Revolutionary Sires, which, on April 30, 1889, became the Society of the Sons of the American Revolution. (See SONS OF THE AMERICAN REVOLUTION, SOCIETY OF THE.) The Society of the Sons of the Revolution has priority over the previously mentioned society in the Eastern States and has almost identical requirements, for it admits to membership lineal descendants of participants in the War of the Revolution. (See SONS OF THE REVOLUTION.) Similarly the Naval Order of the United States (q.v.) admits to membership any officer, or descendant of one, who served in the naval forces of the United States during the War of the Revolution or any of the subsequent wars. Enlisted men who have received the naval medal of honor are also eligible to membership. One of the most distinguished among the patriotic societies is the Military Order of Foreign Wars, which admits to membership commissioned officers who participated in the foreign wars of the United States and their direct lineal descendants in the male line. See FOREIGN WARS, MILITARY ORDER OF.

Originally the Sons of the American Revolution admitted to membership women, but, this being found unsatisfactory, special organizations were instituted for women, the first of which was the Society of the Daughters of the American Revolution, which admits any woman of acceptable character descended from an ancestor who rendered material aid to the cause of inde-

pendence. (See DAUGHTERS OF THE AMERICAN REVOLUTION, SOCIETY OF.) Of similar nature is the Daughters of the Revolution (q.v.). Other societies are the Daughters of the Cincinnati, organized in New York City in 1894, and the Dames of the Revolution, organized in New York City in 1896. The Society of the Children of the American Revolution, with a membership of boys and girls too young to join the older societies, was organized in Washington in 1895. There was organized in 1897 a Society of the Descendants of the Signers of the Declaration of Independence, to which any person over 21 years of age who is lineally descended from a signer of that immortal document is eligible.

Of the period subsequent to the War of the Revolution and prior to the Civil War, there are comparatively few associations that are both patriotic and hereditary, although worthy of mention of that character is the St. Nicholas Society of New York, organized in New York City on Feb. 28, 1835. This society admits natives or residents of New York State who are descended from residents of the State prior to 1785. The War of 1812 is commemorated by the Veteran Corps of Artillery. (See WAR OF 1812, MILITARY SOCIETY OF THE, by which name it has been known since 1892.) The General Society of the War of 1812 admits to membership any male person who is lineally descended from a participant in the War of 1812. (See WAR OF 1812, GENERAL SOCIETY OF.) Corresponding to the last mentioned is the Society of the United States Daughters of 1812. (See UNITED STATES DAUGHTERS OF 1812.) The memory of the War of Mexico is preserved by the Aztec Club of 1847 (q.v.). The Association of Mexican Veterans admits to membership descendants of any participant who served in that war. Daughters of the Republic of Texas consists of lineal descendants of those who served in the military or civil service of the Republic of Texas prior to its annexation in 1845.

The Civil War proved rich in the formation of commemorative societies. One of the most important of these is the Military Order of the Loyal Legion, which admits to membership officers who participated in the war, and as a second class the eldest sons of living original members. (See LOYAL LEGION OF THE UNITED STATES, MILITARY ORDER OF.) The Grand Army of the Republic (q.v.), popularly known as the G. A. R., admits to membership any soldier or sailor who was honorably discharged after service. As the Grand Army grew in strength, there was organized as an auxiliary the Woman's Relief Corps (q.v.), which admits to membership mothers, wives, daughters, and sisters of Union soldiers. Also auxiliary to the Grand Army is the Sons of Veterans (q.v.). The Union Veteran Legion (see VETERAN LEGION, UNION) draws the line closer than the G. A. R., for it admits only those who volunteered prior to July 1, 1863, for a term of three years. That is to say, it will not admit any drafted person or substitute. It has as an auxiliary the Ladies of the Union Veteran Legion, which was organized in Newark, Ohio, on Feb. 20, 1890. The Union Veteran Union (see VETERAN UNION, UNION) admits veterans who served between April 12, 1861, and April 30, 1865, and who participated in one or more engagements or battles and received an honorable discharge. Of broader scope than the foregoing is the Army and Navy Union of the United States of America, in which

any honorably discharged soldier, sailor, or marine, without regard to time or length of his service, is eligible for membership. The Medal of Honor Legion (q.v.) is composed of officers and enlisted men who have received the medal of honor (q.v.) for distinguished conduct in action. There is also a Military Order of the Medal of Honor with similar membership and objects. The United States Veteran Navy (q.v.) admits to membership any officer or enlisted man in the naval service during the period of the Civil War or during the Spanish-American War. There is also the National Association of Naval Veterans, to which any officer or enlisted man who served in the navy or marine corps during the period of the Civil War is eligible. (See NAVAL VETERANS, NATIONAL ASSOCIATION OF.) Mention should also be made of the Society of the Army of the Cumberland, Society of the Army of the Potomac, and Society of the Army of Tennessee, as well as the Eleventh Army Corps Association, whose character is evident from their names. They now admit to membership descendants of original members, thus becoming hereditary societies.

The history of the Confederate States of America is preserved by three organizations, the oldest of which is the United Confederate Veterans, which admits to membership any soldier or sailor who served in the Confederate service during the Civil War. (See CONFEDERATE VETERANS, UNITED.) The United Sons of Confederate Veterans admits to membership any male descendants over 16 years old of a soldier or sailor who served in the Confederate army or navy. (See CONFEDERATE VETERANS, UNITED SONS OF.) The United Daughters of the Confederacy admits to membership the widows, wives, mothers, sisters, and lineal descendants of those who served in the army or navy of the Confederate States. See CONFEDERACY, UNITED DAUGHTERS OF THE.

The long period between the Civil War and the War with Spain saw the organization of two patriotic societies—the Order of the Indian Wars of the United States, founded at Chicago in 1896, and the Society of Veterans of Indian Wars of the United States, established at Philadelphia in the same year. The War with Spain (1898) was prolific in the formation of war societies. Corresponding to the Loyal Legion is the Naval and Military Order of the Spanish-American War, which admits to membership officers who were on the active list in the United States army, navy, marine corps, or revenue marine during the War with Spain or the subsequent insurrection in the Philippines. (See SPANISH-AMERICAN WAR, NAVAL AND MILITARY ORDER OF.) The most important organization of this period, however, is the United Spanish War Veterans (q.v.), which admits to membership soldiers and sailors of the regular and volunteer armies, navy, and marine corps who served honorably during the war. This society was organized in April, 1904, and was a consolidation of the National Army and Navy Spanish War Veterans, National Association of Spanish-American War Veterans, and the Society of the Service Men of the Spanish War, to which was added in 1906 the Legion of Spanish War Veterans and in 1908 the Veteran Army of the Philippines. The Society of the Army of Santiago de Cuba admits to membership all officers and soldiers of the United States army who served with the expeditionary force to Santiago de Cuba. (See

SANTIAGO DE CUBA, SOCIETY OF THE ARMY OF.) The occupation of Porto Rico gave rise to the Military and Naval Society of the Porto Rican Expedition. (See PORTO RICAN EXPEDITION, MILITARY AND NAVAL SOCIETY OF.) The members of the first regiment of United States Volunteer Cavalry that served in Cuba, before disbanding, organized the Rough Riders' Association. The Spanish-American War in the West Indies was also productive of the Society of the Caribbean, which was founded by American war correspondents who participated in the naval and military campaigns in Cuba and Porto Rico. Service in the Philippines led to the organization of the National Society of the Army of the Philippines. Membership is extended to soldiers and sailors who served during the war in the Philippine Islands. The Military Order of the Carabao was formed in the Philippines by officers who served in those islands during the fighting period, and any officer is eligible to membership who was there prior to July 4, 1902. Participants in the Chinese expedition for the relief of Peking, on their return to Manila, organized the Military Order of the Dragon.

The Mount Vernon Ladies' Association has for its special purpose the preservation of the home of Washington. Of similar nature is the Ladies' Hermitage Association, which cares for the home of Andrew Jackson, near Nashville, Tenn., and the Betsy Ross Memorial Association, which has saved the house in Philadelphia where the first American flag was made. The American Flag Association, organized in 1898, is a union of the flag committees of the patriotic societies of the United States and also of individual members. Its object is to preserve the American flag from desecration. The George Washington Memorial Association, which was incorporated in 1898, has for its purpose the erection of a George Washington Memorial building in the city of Washington. The Landmarks Club in Los Angeles is doing a splendid work in the restoration and preservation of the old missions which were left by the Spanish occupants of Alta California, and the beautiful missions near San Antonio are cared for by an organization of women in Texas. In Colorado the cliff dwellings of the Mancos Cañon were leased by the Colorado Cliff Dwellers' Association; through their efforts the permanent preservation of these ancient ruins has been secured. A national body has been formed known as the American Scenic and Historic Preservation Society, which is doing excellent work. (See SCENIC AND HISTORIC PRESERVATION SOCIETY, AMERICAN.) Consult S. A. Phillips, *The Patriotic Societies of the United States* (New York, 1914).

PATRIOTS' DAY. The anniversary celebrated in Maine and Massachusetts of the double battle of Concord and Lexington on April 19, 1775. It was first observed April 19, 1894.

PATRIPAS'SIANISM (from Lat. *patrius*, relating to a father, from *pater*, father + *passio*, suffering, from *pati*, to suffer, to endure). One variety of monarchianism, a belief held by many Christians in the West about 200 A.D., according to which Christ and God were so completely identified that the Father himself was said to have suffered and died on the cross. It seems to have originated in the East, but was brought to Rome by Praxeas, late in the second century, and a little later by Noëtus of Smyrna. Its most famous advocate was Sabel-

lius (q.v.), whose name is often used to designate this form of belief (Sabellianism). The origin of the position was a strong reaction from such distinctions between God and Christ as would make them seem to be two Gods. Tertullian and Hippolytus vigorously attacked the Patripasianists, or Modalists, as they are also called. Largely under the influence of Origen's teaching, the Church rejected modalism, and defined the Catholic doctrine of the Trinity so that it expressed personal distinctions in the Godhead. Consult: I. A. Dorner, *History of the Development of the Doctrine of the Person of Christ* (Edinburgh, 1861-63); W. Mackintosh, *Study of the Doctrine of Jesus* (Glasgow, 1894); G. P. Fisher, *History of Christian Doctrine* (New York, 1896); Adolf Harnack, *History of Dogma*, vol. ii (trans. from 3d Ger. ed. by Neil Buchanan, Boston, 1897). See ATHANASIUS; MONARCHIANS; NICÆA, COUNCILS OF.

PATRISTIC THEOLOGY. The name applied to the teachings of the early Christian writers who are collectively known as fathers (q.v.) of the Church. They are commonly divided as follows: 1. The apostolic fathers. These include Clement of Rome, Polycarp, Ignatius, Barnabas, Hermas, and Papias. 2. The ante-Nicene fathers of the second and third centuries, whose work is mainly of an apologetic nature, against Jews on the one hand and Gentiles on the other. Of these the principal names are Justin Martyr, Irenæus, Clement of Alexandria, and Origen in Greek, and Tertullian and Cyprian in Latin. 3. The Nicene fathers of the fourth century, who set forth the fully developed doctrines of the Trinity and the incarnation and defended them against heretics on both sides of the received teachings. They include Eusebius the historian, Athanasius, Gregory of Nazianzus, Gregory of Nyssa, Cyril of Jerusalem, John Chrysostom, and Epiphanius in Greek, Hilary of Poitiers, and Ambrose in Latin. 4. Classed as post-Nicene are, in the East, Cyril of Alexandria, Theodoret and John of Damascus; in the West, Jerome, Augustine, Leo the Great, and Gregory the Great. For extended treatment, see the articles under each of these names. There were three great theological movements during this period: (1) that represented by Clement and Origen, in which Greek philosophy was brought into connection with Christianity, especially in the development of the doctrine of the Logos (q.v.) as an explanation of the person of Christ; (2) that led by Athanasius, which issued in the definition of the person of Christ as expressed in the Nicene Creed (see CHRISTOLOGY); (3) that which discussed the problem of God's sovereignty and man's free will, forming the basis of the later theology of the Western church on the subjects of sin and redemption. This movement is best expressed by Augustine (q.v.). Consult Adolf Harnack, *History of Dogma* (trans. from 3d Ger. ed. by Neil Buchanan, 7 vols., Boston, 1897-1900), giving a full treatment of the theology of the period.

PATROCLUS (Lat., from Gk. Πάτροκλος, *Patroklos*). In Greek legend, a son of Menæceus and friend of Achilles (q.v.). According to the common story, while yet a boy in Opuntian Locris, he accidentally killed a playmate and in consequence was brought by his father to Peleus, father of Achilles, at Phthia. With Achilles he went to the Trojan War. Though

he was mentioned in the stories of the earlier years of the Trojan War, it is through the *Iliad* that his name has become familiar to us. At the crisis of the battle, when the victorious Trojans had begun to burn the Greek ships, Patroclus persuaded Achilles, who in anger had withdrawn from the fighting, to allow him to lead the Myrmidons to the rescue. At their head he drove the routed Trojans to their walls, but fell before Apollo and Hector. Over his body raged one of the fiercest struggles described in the poem, and it was only when the cry of Achilles struck panic among the Trojans that the Greeks were able to bear the body of Patroclus to the ships, where it was mourned in touching verses by Achilles. In later times Patroclus was worshiped as a hero on the Hellespont, where he was believed to be buried with Achilles, and at Opus in Locris.

PATROL' (from Fr. *patrouiller*, to patrol, dabble in the water, paw, OF. *patrouiller*, *patouiller*, *patoiller*, to paddle through water, from *patte*, *pate*, paw). Small detachments employed for a variety of purposes, the name of the detachment indicating its duty, as visiting, connecting, combat, exploring, reconnoitring, flanking, harassing, pursuing patrols, etc. *Visiting* patrols maintain communication between the parts of the outpost and supervise the performance of duty on the line of observation. (See **OUTPOST**.) *Connecting* patrols keep separated bodies of troops in touch with each other and are usually composed of cavalry. *Combat* patrols are usually disposed on the flanks to give warning and protect from a sudden surprise and attack. They are usually of sufficient strength to delay such an attack. *Exploring* patrols are usually required to furnish road sketches or maps. *Flanking* patrols are located, as their name indicates, with a view to securing information of the enemy's approach from the side. *Harassing* and *pursuing* patrols are combat patrols with the special missions indicated by their names.

Reconnoitring patrols are employed to gather military information for the use of commanders in the field charged with the duty of leading troops. Such patrols habitually seek safety in concealment or flight, fighting *only* when their mission demands it. The most skillful patrolling is where patrols accomplish their mission and return without being discovered by the enemy.

The commander determines the number and strength of patrols and when they are to be sent out. It is a cardinal principle to send out only such patrols as insure effective reconnaissance. Patrols vary in strength from two or three men to a company. Small patrols have great mobility, are easily concealed, and do not draw heavily on the fighting strength. In hostile territory, or when resistance is expected, stronger detachments are required. These cover themselves with small patrols of two to four men, the remainder acting as support. The officer sending out a patrol verifies the detail, designates a second in command, and gives the necessary instructions. Horses of conspicuous color and those that neigh when alone should not be sent. Precautions are taken to avoid the glitter and rattle of weapons and equipment.

The orders or instructions for a patrol, or for any detachment going on reconnaissance, must state clearly where the enemy is or is

supposed to be, what information is desired, what features are of special importance, the general direction to be followed, whether friendly patrols are liable to be encountered, and where messages are to be sent or the patrol is to report. Important and comprehensive instructions should be in writing, but precautions against capture of papers must be taken. An officer sending out a patrol must be certain his orders are understood. Detailed instructions are, as a rule, avoided. When necessary, the time of return is stated. Patrol leaders are selected with care, officers being detailed for important missions. They may often find themselves in positions where the situation must be viewed from the standpoint of a higher commander and should be able to reason accordingly. In the conduct of the patrol the greatest vigilance must be exercised to prevent discovery. For this reason no normal formation is or should be prescribed. Whatever the formation, it should favor the escape of at least one man to bring back the information. In questioning civilians care must be taken not to disclose information that may be of value to the enemy. Indications of the enemy should be at once reported to the patrol leader, and with all such indications every member of the patrol should be familiar by training and experience. A system of simple signals for use between the members of the patrol should be devised and practiced. The information most desired by a commander from his patrols is the number, character, and condition of the enemy, the direction in which he is marching, and whether the enemy troops discovered are the main body or the advance guard or outposts. To obtain this information requires a patrol leader possessing good health, vigorous physique, keen eyesight, presence of mind, and courage, with good judgment, military training, and experience. Consult Bond and McDonough, *Technique of Modern Tactics* (Menasha, Wis., 1913), and *Field Service Regulations of the United States Army*, 1914 (Washington, 1914).

PA'TRON (OF., Fr. *patron*, from Lat. *patronus*, protector, from *pater*, father). Among the Romans, originally the appellation of a citizen who had dependents, noncitizens, called clients, attached to him. Before the time of the Laws of the Twelve Tables the most frequent use of the term *patronus* was in opposition to *libertus*; the two words were used to signify persons who stood to one another in the relation of master and manumitted slave. The Roman was not deprived of all right in his slave when he freed him; a tie remained somewhat like that of parent and child, and the law recognized important obligations on the part of the *libertus* towards his patron, the neglect of which involved severe punishment. In some cases the patron could claim a right to the whole or to a part of the property of his freedman. The original idea of a patron apart from the manumitter of slaves continued to exist. A free Roman, a plebeian, whether citizen or not, desirous of a protector, might attach himself to a patron, whose client he thenceforward became; in this way he secured connection with a *gens*. Distinguished Romans were sometimes patrons of dependent states or cities, particularly where they had been the means of bringing them into subjection. Thus, the Marcelli were patrons of the Sicilians because Claudius Marcellus had conquered Syracuse and Sicily. The patron was

the guardian of his client's interests, public and private; as his legal adviser, he vindicated his rights before the courts of law. The client was bound on various occasions, if he was able, to assist the patron with money, as by paying the costs of his suits, contributing to the marriage portions of his daughters, and defraying in part the expenses incurred in the discharge of public functions. Patron and client were under an obligation never to accuse each other; violation of this law was tantamount to treason, and any one might slay the offender with impunity. This relationship between patron and client remained virtually unchanged down to 100 B.C. From that time on, especially after the establishment of the Empire under Augustus, the relation became more and more a purely formal one, till in the time of Juvenal and Martial the main duty of the client (who was often himself a person of consequence) was to attend his patron in public; in return he received a daily dole, the *sportula*, in food or in money. As the patron long was in the habit of appearing in support of his clients in courts of justice, the word *patronus* acquired in course of time the signification of advocate or legal adviser and defender, the client being the party defended; hence the modern relation between counsel and client. Patron in after times became a common designation of every protector or powerful promoter of the interests of another; and the saints, who were believed to watch over the interests of particular persons, places, trades, etc., acquired in the Middle Ages the designation of their patron saints. The saint in whose name a church is founded is considered its patron saint. For the earlier period, consult G. W. Botsford, *The Roman Assemblies* (New York, 1909).

PATRONAGE (Lat. *patronaticum*, homage due a patron, from Lat. *patronus*, protector), ECCLESIASTICAL. The right of presenting a properly qualified person to a vacant ecclesiastical position. Such a right is under many circumstances a species of property that may be enforced in the proper courts of law. The most important distinction is between lay and ecclesiastical patronage—the first exercised by laymen, the second by ecclesiastics holding some particular office. The patron originally was the person who founded or endowed the benefice, yet the title came to be applied also to one who succeeded to the right as property. Proprietors of lands were early encouraged to build and endow churches on their own possessions. In such cases the priest in charge did not look to the bishop for his support, but was allowed to receive the whole or a part of the profits of the lands with which the founder had endowed the church. In 655 the Council of Toledo granted to laymen the right to nominate a person in holy orders to be the incumbent of churches founded by them. The person enjoying the privileges of a founder was called *patronus* and *advocatus*. He had a prominent seat and a burial place in the church; his name and arms were engraved on the church and on the church walls, and he was specially named in the public prayers. He sometimes also had a right to a portion of the church funds, called *patronagium*.

In France the right of patronage was often extended by the sovereigns to churches not originally private foundations. Church property was bestowed in fee on laymen, who appropriated the greater part of the revenues and took the

appointment of the clergy into their own hands. It was at last ruled by the third and fourth Lateran councils (1179 and 1215) that the presentation of the patron should not of itself suffice to confer any ecclesiastical benefice when the presentee was a layman.

Towards the close of the twelfth century letters of request began to be issued by the popes to patrons that benefices should be bestowed upon particular persons. What had at first been requested as a favor was soon demanded as a right. In the thirteenth century the patronage of all livings whose incumbents had died at the court of Rome (*vacantia in curia*) was also claimed by the Pope. By the fourteenth century these claims encountered effective opposition. England took the lead in a resistance which was in the end successful. In Scotland, at the time of the Reformation, the rights of patrons were reserved, and the presbyteries were bound by several statutes to admit any qualified person presented by the patron. For three centuries the question of lay patronage was a cause of contention, legislation, and litigation, but by an Act of Parliament passed in 1874 patronage in Scotland was abolished and the right of choosing their minister transferred to the congregation. Upon the continent of Europe, in the Protestant churches of Germany, Denmark, Sweden, and Norway, ecclesiastical patronage exists to some extent. The only form of ecclesiastical patronage to be found in the United States is that in the hands of the bishops of the Roman Catholic church. With these rights the decrees of the plenary councils of Baltimore have dealt upon the general principles laid down by the canons of the third and fourth Lateran councils.

PA'TRONS OF HUSBANDRY. See GRANGE.

PATRONYMIC (Lat. *patronymicus*, from Gk. *πατρωνικός*, *patrōnomikos*, relating to one's father's name, from *πατήρ*, *patēr*, father + *ὄνομα*, *onoma*, name). Properly a name taken from one's father, but generally applied to such names as express descent from a parent or ancestor. In Sanskrit, Greek, and Latin patronymics are very numerous. They may be derived from the name of a father, mother, grandfather, or remoter ancestor, as Atrides, son of Atreus; Æacides, grandson of Æacus. The names of the founders of nations have also been used to form a sort of patronymic, as when the Romans were called Romulide. In Old and Middle High German the suffixes *ung* and *ing* were patronymics, as, e.g., in *Karolingen*, the descendants of Charles, and *Nibelungen*, the sons of Nibel. In Slavic the patronymic *Pavlovitch* is the "son of Paul," while the matronymic *Pavlovna* means the "daughter of Paul." The usual patronymic suffix in Anglo-Saxon was *-ing*. A number of the surnames in use in modern times are patronymics, as Johnson, the son of John. Originally these names fluctuated from generation to generation, as was the case in Shetland, where Magnus Johnson's son called himself John Magnusson or Manson. In the course of time it was generally found more convenient to take a surname from one well-known ancestor, which should descend unchanged to the children of the bearer of it. Consult Gubler, *Die Patronymica im Alt-Indischen* (Göttingen, 1903).

PATROON (Dutch *patroon*, protector, patron, from Lat. *patronus*, protector). The name applied to a special class of settlers in New

Netherland. In 1629, in order to encourage the emigration of farmers to America, the Dutch West India Company granted certain "freedoms and exemptions" to such of their number as within a period of four years after having given due notice should plant a colony of 50 persons over 15 years of age in New Netherland. Such men were to be called patroons (or patrons), and each was to have as his "absolute property" a tract of land extending 16 miles along any navigable river (or 8 miles if on each shore) and "so far into the country as the situation of the occupiers will permit." The proprietors were, besides, invested with many feudal privileges, being empowered to hold both civil and criminal courts, to appoint local officers and magistrates, and to punish offenders against the law, except in certain specified cases, where there existed a right of appeal to the Director General at Fort Amsterdam. In practice, however, this right was virtually abrogated. The settlers were to be exempt from taxes for 10 years, but were to be absolutely bound to their patroon for a specified period and were to pay certain rentals, either in money or in kind. Schools and churches were to be established, but at the same time slavery was introduced, commerce was restricted, and manufacturing was prohibited on pain of banishment. Several patroonships were soon established, the largest (and the first) being Rensselaerswyck, which remained in the Rensselaer family until about the middle of the nineteenth century. In 1640 a new charter of "freedoms and exemptions" was granted, by which patroonship privileges were extended to "all good inhabitants of the Netherlands," the period of settlement limited to three years, the prohibition of manufacturing rescinded, and the size of the grants limited to 4 miles along the coast or bank of a navigable river and 8 miles into the interior. At the same time many inducements were offered to smaller landholders, called masters or "colonists." The system gave New York one of its characteristic features throughout the Colonial period, creating as it did a landed aristocracy, fostering class divisions and semifederal relations between landholder and tenant, and discouraging the immigration of settlers, who naturally preferred to obtain land in fee simple in other Colonies rather than become tenants of proprietors in New York. Under the English régime the system remained unchanged, but in 1775 the patroons became mere proprietors of estates. Many characteristics of the old feudal tenure, however, remained, and the relations between tenant and landlord became more strained, until a modification was effected by the antirent agitation of 1839-47. Consult E. B. O'Callaghan, *History of New Netherland* (2 vols., New York, 1846), and D. S. Alexander, *Political History of the State of New York* (3 vols., ib., 1906-09). See ANTIRENTISM.

PATTAN, pá-tán'. A town of India. See PATAN.

PATTE, pá'tá' (OF. *patte*, broad-footed, from *patte*, paw). A term in heraldry (q.v.) applied to a cross with its arms expanding towards the ends and flat at their outer edges.

PATTEN, JAMES A. (1852-). An American financier and grain merchant, born at Freeland Corners, Ill. He attended the common schools and was early a clerk, a farmer, and (1874-78) employed in the State department of grain inspection, where he learned the

details and operation of the grain commission business. Between 1878 and 1910 he was a member of several firms, from 1880 to 1903 being associated with his brother. Patten was Republican mayor of Evanston in 1901-05. He was prominently before the public in connection with an attempt to corner the wheat crop in 1909. It was alleged that Patten himself secured control of more than 23,000,000 bushels of wheat, and that these holdings, together with those of his associates, were sufficient to force the price of wheat and flour up, while he gained enormous profits. The result was a charge against him of manipulation and indignant censure throughout the country and abroad. Patten also operated his business in Liverpool, where in 1911 his appearance provoked a riot.

PATTEN, SIMON NELSON (1852-). An American economist, born at Sandwich, Ill. He was educated at Jennings's Seminary (Ill.), Northwestern University (Ill.), and at the University of Halle, Germany, and received the degree of Ph.D. in 1878. During the next 10 years he taught in the public schools of Iowa and Illinois. In 1888 he was elected professor of political economy at the University of Pennsylvania. In 1908-09 he served as president of the American Economic Association. His principal works are: *Premises of Political Economy* (1885); *The Consumption of Wealth* (1889); *Malthus and Ricardo* (1889); *The Stability of Prices* (1889); *The Economic Basis of Protection* (1890); *The Principles of Rational Taxation* (1890); *The Theory of Dynamic Economics* (1893); *The Place of University Extension* (1894); *The Theory of Social Forces* (1896); *Development of English Thought* (1899); *The Theory of Prosperity* (1901); *Heredity and Social Progress* (1903); *The New Basis of Civilization* (1907); *Product and Climax* (1909); *The Social Basis of Religion* (1911); *The Reconstruction of Economic Theory* (1912). Professor Patten ranks as one of the most brilliant and original of American economic writers. His chief contributions to economics were his analyses of dynamic forces in economic life, of monopoly elements in value, and of the bearing of the laws of consumption upon distribution. A large part of his work is in the field of sociology.

PATTEN, WILLIAM (1861-). An American zoölogist, born at Watertown, Mass. He graduated from Harvard University in 1883 and received the Ph.D. degree at Leipzig in 1884. Patten was assistant in the Lake Laboratory at Milwaukee, Wis., from 1886 to 1889, professor of biology in the University of North Dakota from 1889 to 1893, and thereafter professor of zoölogy at Dartmouth College. He published *The Evolution of Vertebrates and their Kin* (1912) and numerous articles on invertebrate anatomy and embryology in zoölogical journals.

PATTERSON. A town in St. Mary Parish, La., 87 miles by rail southwest of New Orleans, on the Atchafalaya River and on the Southern Pacific Railroad (Map: Louisiana, G 7). It contains a fine high-school building and St. Mary's Hospital. The surrounding country is adapted to lumbering and the growing of sugar cane. The water works are owned by the town. Pop., 1910, 2998.

PATTERSON, CARLILE POLLOCK (1816-81). An American civil engineer, superintendent of the United States Coast Survey, born at Shields-

boro, Miss. He was appointed midshipman in 1830, served in the Mediterranean squadron, and, after graduation at Georgetown College as a civil engineer in 1838, was attached to the Coast Survey (1838-41). In 1845 he led a hydrographic expedition to the Gulf of Mexico, from 1850 to 1861 commanded the Pacific mail steamer *Oregon*, in 1861 was appointed hydrographic inspector in the United States Coast Survey and in 1874 superintendent. This department was greatly developed by him.

PATTERSON, DANIEL TOD (1786-1839). An American naval officer, born on Long Island, N. Y. He entered the navy in 1800 and was on board the frigate *Philadelphia* in the expedition commanded by Capt. William Bainbridge when the frigate ran upon the rocks off the coast of Tripoli, and the entire crew were held prisoners until peace was declared. In 1813 he was promoted to be commander. In September, 1814, he commanded the expedition which broke up the establishment of the pirate Jean Lafitte (q.v.) in Barataria Bay. He was made captain in 1815, commanded the frigate *Constitution* from 1826 to 1828, and in the latter year was appointed navy commissioner. In 1832-36 he commanded the Mediterranean squadron and on his return was appointed commander at the navy yard at Washington, where he remained until his death.

PATTERSON (BONAPARTE), ELIZABETH (1785-1879). An American woman, famous as the wife of Jerome Bonaparte. She was born in Baltimore, Md., and was the daughter of William Patterson, one of the wealthiest men in the United States. When Jerome Bonaparte visited Baltimore in 1803, he fell in love with Miss Patterson, and the two were married by Bishop Carroll, Dec. 24, 1803. In April, 1804, Napoleon, through M. Pichon, Consul General of France in New York, declared the marriage illegal and ordered Jerome to return to France and to leave the "young person" behind. The other members of his family, however, accepted the situation and promised to receive her. In 1805 Jerome and his wife sailed for Europe. The latter, not being allowed to land either at Lisbon or Amsterdam, went to England, and her son, Jerome Napoleon, was born at Camberwell, July 7, 1805. Meanwhile Napoleon had requested unsuccessfully the annulment of the marriage from Pope Pius VII, but the Council of State granted the divorce. In November Madame Bonaparte returned to the United States and lived with her father. After the battle of Waterloo she went to Europe, where she was well received in the most exclusive circles and was much admired for her beauty and wit. In 1815, by special Act of the Legislature of Maryland, she secured a divorce. From 1816 to 1819 she was in Baltimore and subsequently spent much of her time in Europe. Her last years were spent in Baltimore in the management of her estate, whose value she increased to \$1,500,000. Consult F. B. Goodrich, *The Court of Napoleon III* (Philadelphia, 1864), and E. L. Didier, *Life and Letters of Madame Bonaparte* (New York, 1879).

PATTERSON, JAMES COLEBROOKE (1839-). A Canadian lawyer and statesman. He was born at Armagh, Ireland, and was educated in Dublin. Going to Canada in 1857, he first engaged in teaching, but later studied law and was called to the bar in 1876. Removing to Windsor, Ontario, he served as a Conservative

member of the Ontario Legislature (1874-78) and later of the House of Commons (1878-95). During 1891-95, in the brief Conservative Ministries after the death of Sir John A. Macdonald, Patterson was, first, Secretary of State and afterward Minister of Militia and Defense. He was Lieutenant Governor of Manitoba and Keewatin in 1895-1900.

PATTERSON, ROBERT (1743-1824). An American educator and director of the mint. He was born near Hillsborough, County Down, Ireland, emigrated to the United States in 1768, and lived for a time in Philadelphia. In 1774 he became principal of an academy in Wilmington, Del. In the disputes between the Colonies and the British ministry he allied himself with the Whig or Patriot party, and in the early part of the Revolutionary War served as assistant surgeon and brigadier major in the Continental army. From 1779 to 1814 he was professor of mathematics in the University of Pennsylvania, being also from 1810 to 1813 vice provost. In 1805 President Jefferson appointed him director of the mint, which position he held until a short time before his death. Always actively interested in the American Philosophical Society, he was its president from 1819 until his death. He published *The Newtonian System* (1808) and edited various works on mathematics and physics.

PATTERSON, ROBERT (1753-1827). An American pioneer, born in Pennsylvania. He emigrated to Kentucky in 1775. In October, 1776, on a trip to Fort Pitt to secure ammunition, his party was attacked by Indians, and every member was killed or wounded. He took part in Col. George R. Clark's successful expedition against Kaskaskia and Vincennes in 1778 and in Capt. John Bowman's attack on Chillicothe in 1779. In April, 1779, he built a blockhouse on the present site of Lexington, Ky. In 1780 he was a captain in Colonel Clark's expedition against the Shawnees and in 1782 was second in command under Daniel Boone at the lower Blue Lick. He was a colonel in Clark's second expedition into the Miami country this year and served with Gen. Benjamin Logan's expedition against the Shawnees in 1786, in which he was severely wounded. He, with two companions, bought from John Cleves Symmes a tract of 740 acres of land opposite the mouth of the Licking River and founded in 1788 the town of Losantiville, now Cincinnati. He sold his interest in 1794 and in 1804 settled in Dayton, Ohio, where he lived until his death.

PATTERSON, ROBERT (1792-1881). An American soldier, born at Cappagh, County Tyrone, Ireland. About 1798 he came with his parents to the United States and finally settled in Philadelphia. During the War of 1812 he was assistant deputy quartermaster general with rank of captain from 1813 to 1814 and in 1814 was appointed captain of the Thirty-second Infantry. He was commissioned major general of volunteers in 1846 and in the Mexican War commanded a division at Cerro Gordo, directed the pursuit of the retreating Mexicans by the cavalry and leading infantry brigades, and occupied Jalapa. Under President Lincoln's three-months call for troops (April 15, 1861) he was appointed by Governor Curtin, of Pennsylvania, major general of volunteers, organized the three-months forces in Philadelphia, and later commanded the Department of Pennsylvania. When McDowell began his march against Beauregard,

Patterson was instructed to detain Johnston and prevent him from supplying Beauregard with reinforcements. This, however, he failed to accomplish. He withdrew to Charleston, about 18 miles from Winchester, and Johnston's entire force arrived in time to take part in and determine the result of the first battle of Bull Run. A long controversy ensued as to the responsibility for this event, and Patterson was vigorously criticized in some quarters. He published a vindication entitled *A Narrative of the Campaign in the Valley of the Shenandoah in 1861* (1865). Patterson was mustered out on July 27, 1861. He invested largely in the sugar and cotton industries and was among the leading American mill owners.

PATTERSON, ROBERT WILSON (1850-1910). An American newspaper editor and publisher. He was born in Chicago, graduated from Williams College in 1871, and then began the study of law. After the great fire in Chicago he became a reporter on the *Times*, later joined the staff of the *Interior*, and in 1873 became connected with the *Chicago Tribune*, of which he was successively assistant night editor, Washington correspondent, editorial writer, managing editor, and editor in chief. He was also president of the Chicago Tribune Company.

PATTESON, JOHN COLERIDGE (1827-71). An English missionary, Bishop of Melanesia. He was born in London, was educated at Ottery St. Mary, at Eton, and at Balliol College, Oxford. He obtained a fellowship at Merton, went to Dresden to study German, and was ordained in 1853 to the curacy of Alfrington, near Ottery St. Mary. In 1855, having been influenced by Bishop George Augustus Selwyn (q.v.), he left England with the Bishop to enter upon a missionary career. His first work was instructing boys of the Melanesian Islands, and when the mission was regularly established there he was, in 1861, consecrated Bishop, and fixed his residence at Mota. He spoke as many as 23 of the native dialects and made translations of parts of the Bible into the Mota tongue, which he regarded as typical. He made great improvements in the material and spiritual condition of the natives. His position was rendered difficult by the action of British traders who sometimes used his name to further the kidnapping of natives to be either enslaved or held as laborers upon the plantations of Fiji and Queensland. In mistaken revenge for such an outrage against the islanders of Nakapu, the Bishop himself was slain by the natives. Consult his *Life* by C. M. Yonge (London, 1878), also Frances Awdry, *The Story of a Fellow Soldier* (ib., 1875).

PATTI, pat'té. A town in the Province of Messina, Sicily, situated on the north coast, 35 miles west by south of Messina by rail (Map: Italy, E 5). Its cathedral contains the tomb of Adelasia, mother of King Roger II of Sicily. The town has silk mills, potteries, sandstone quarries, and a shipping trade in olive oil, flour, and fish. Pop. (commune), 1901, 11,082; 1911, 10,535.

PATTI, ADELINA (1843-). An operatic singer of Italian parentage, born in Madrid, Spain. When about 10 years of age, she appeared in a series of concerts with Ole Bull and Maurice Strakosch. After a course of professional study she made her first operatic appearance (1859) in New York. Her real début, which occurred in London, took place in 1861,

when she appeared as Amina in *La Sonnambula*, after which she was acknowledged one of the greatest artists of her day. Her voice was an unusually high soprano, of rich, bell-like quality and remarkable evenness of tone; to these qualities she added purity of style and high artistic finish. She was as popular throughout continental Europe as in England and America. Patti was married first (1868) to the Marquis de Caux (divorced, 1885); in 1886 to Ernesto Nicolini, a well-known tenor (died, 1898); and in 1899 to Baron Cederström, a Swedish nobleman. She made her residence in Wales, being owner of a magnificent castle. After about 1890 she confined herself almost entirely to the concert platform. Carlotta Patti was her sister.

PATTI (DE MUNCK) CARLOTTA (1840-89). An Italian singer, sister of Adelina Patti. She was born in Florence, of musical parents, who were also her first teachers in singing. She afterward studied the piano under Henri Herz at Paris. Her voice was a soprano of unusual compass and of a clear silvery quality, and much power in the upper register; a slight degree of lameness, however, prevented her from appearing in opera. Her peculiarly sweet high notes brought her into favor with the public. She made her début in New York in 1861, where for some years previously she had made her home. She became very popular throughout America as a concert soprano and was almost as successful in Europe, her first appearance there occurring in 1863 in London. Like her sister, she was a brilliant coloratura vocalist. She married De Munck, a violoncellist, in 1879. She died in Paris.

PATTISON, ANDREW SETH PRINGLE. See PRINGLE-PATTISON, A. S.

PATTISON, DOROTHY WYNDLOW (1832-78), better known as **SISTER DORA**. A famous nurse, sister of Mark Pattison (q.v.). She was born at Haukwell, near Richmond, Yorkshire. In 1864 she joined a sisterhood of the Church of England (the Sisterhood of the Good Samaritan) and early in the following year became a nurse in a cottage hospital at Walsall. In 1867 a new hospital was built, of which she had sole charge until 1877, when she resigned to become head of the municipal hospital in the same place. She had many natural gifts for her work, acquired much skill in surgery, and was tireless in philanthropic labors. Consult her life by Margaret Lonsdale (London, 1880), and Ellen Ridsdale, *Sister Dora; Personal Reminiscences of her Later Years* (ib., 1880).

PATTISON, JAMES WILLIAM (1844-1915). An American figure, landscape, and marine painter, also an author. He was born in Boston and studied under J. M. Hart and George Inness in New York, under Flamm in Düsseldorf, and under Luigi Chialiva in Paris. His paintings were exhibited in the Paris Salon and in various American cities. Among them is "Tranquillity" in the Art Institute, Chicago, where Pattison was faculty lecturer from 1896. He edited the *Fine Arts Journal*, Chicago, from 1910, contributed numerous articles on art to periodicals and newspapers, and is the author of *Painting in the Seventeenth and Eighteenth Centuries* (1901) and *Painters since Leonardo* (1904), both brief and popularly written treatises.

PATTISON, MARK (1813-84). An English scholar and writer, born at Haukwell, Yorkshire. He was educated at Oriel College, Oxford (B.A., 1836; M.A., 1840). He translated

the "St. Matthew" from Thomas Aquinas' *Opuscula Aurea on the Gospels* for Newman (written, 1839; printed, 1842) and also contributed biographies of Stephen Langton and St. Edmund to the series of lives of English saints published under Newman's editorship. In 1839 he was elected fellow of Lincoln and in 1843 was ordained priest. He was appointed to a tutorship of Lincoln in 1843 and in 1848 became examiner in the school of *literæ humaniores*. In 1853 he was again appointed examiner and in 1855 resigned his tutorship. He was then for a time a private tutor at Oxford, but later was much in Germany. In 1861 he was elected rector of Lincoln. He also became a curator of the Bodleian Library and of the Taylor Institution. From 1845 his theological views greatly changed; he separated gradually from the High Church party; he wrote for the *Essays and Reviews* (1860) an article on "Tendencies of Religious Thought in England, 1688-1750," intended as "a neutral and philosophic inquiry," and so recognized on the Continent, but not in England, and he remained a liberal member of the Anglican communion. He is one of those English clergymen who contrived to reconcile for himself rationalism and the Anglican profession of faith. His principal studies, however, were not theological or philosophical, but were directed originally to the preparation of a history of learning. Of this work only fragments were executed, most important of which is the *Life of Isaac Casaubon* (1875, 2d ed., 1892). Other portions appear in the selected *Essays* (2 vols., 1889), edited by H. Nettleship. He also wrote an excellent *Life of John Milton* (1879, reprinted, with alterations, 1880, 1883, 1885, 1887) for the "English Men of Letters Series," and edited Pope's *Essay on Man* (1869; 2d ed., 1872) and *Satires and Epistles* (1872, 2d ed., 1874). An edition by him of the *Sonnets* of Milton, with a valuable introduction, appeared in 1883. Other published volumes are *Sermons* (1885) and the *Memoirs* (to 1860), dictated in 1883 and printed in 1885. Pattison's literary work is for the main part marked by the most thorough scholarship, eminent judgment, and a skillful presentation of material. In real academic distinction he was second to none at Oxford. He was a tireless pedestrian and angler, a student of natural history, brief and often ironic in speech, contemptuous of sham, and so reluctant in the expression of his views as sometimes quite to hamper the proceedings of committees of which he was a member. Consult, besides the *Memoirs* mentioned above, John Morley, in *Critical Miscellanies*, vol. iii (London, 1892).

PATTISON, ROBERT EVERETT (1800-74). An American Baptist clergyman and educator. He was born at Benson, Vt., and was educated at Amherst College. In 1829 he was ordained to the ministry. From 1836 to 1839 he served as president of Waterville (now Colby) College in Maine, from 1843 to 1846 as corresponding secretary of the Baptist Board of Foreign Missions, and then for two years as president of the Western Baptist Theological Institute at Covington, Ky. Again in 1853-58 he presided over Waterville College. Subsequently Dr. Pattison held chairs of theology or philosophy in Newton Theological Institution, the Baptist Theological Seminary, Chicago, and the University of Chicago, where he was also vice president. In 1850 he published a *Commentary on the Epistle to the Ephesians*.

PATTON. A borough in Cambria Co., Pa., 20 miles northwest of Altoona, on the Pennsylvania and the New York Central railroads (Map: Pennsylvania, D 6). The borough is engaged chiefly in agriculture and in the manufacture of clay products. Pop., 1900, 2651; 1910, 3907.

PATTON, FRANCIS LANDEX (1843-). An American Presbyterian clergyman and educator. He was born in Warwick Parish, Bermuda. He studied at Knox College, Toronto, at the University of Toronto, and at Princeton Theological Seminary (New Jersey). Ordained to the ministry in 1865, he held several pastorates and in 1871 was appointed professor of didactic and polemical theology in the Theological Seminary of the Northwest (now McCormick Seminary, Chicago). There he remained for 10 years. During the period from 1873 to 1876 he edited the religious journal the *Interior* (Chicago), in which connection he brought charges of heresy against Prof. David Swing, resulting in the latter's trial and subsequent withdrawal from the church. While in Chicago, he also held the pastorate of the Jefferson Park Presbyterian Church, and in 1878 was elected moderator of the Presbyterian General Assembly. In 1881 he assumed the professorship endowed for him in Princeton Theological Seminary, styled the chair of the relations of philosophy and science to the Christian religion, this he continued to hold until 1888, when he succeeded James McCosh as president of Princeton College. Two years earlier he had become professor of ethics in the college, a chair he occupied until 1913, 11 years after he had resigned as president. From this date (1902) till 1913 he served as president of the seminary. In 1891 and 1892 he was again prominently before the public in a "heresy" trial, as a critic of the views of Dr. C. A. Briggs (q.v.) of Union Theological Seminary. Dr. Patton's administration of Princeton was marked by the official assumption (1896) of the title Princeton University (q.v.) in place of the charter name, The College of New Jersey (long out of use), and by large donations which enabled the university to make extensive additions to its equipment and buildings. The number of students nearly doubled during this period from 1888 to 1902, and new courses were added to both the scientific and academic departments. Perhaps most important in the future development of Princeton as a university was the founding of a graduate school. President Patton became widely known as a convincing speaker and as a keen, logical thinker on theological subjects. After his retirement he made his home at Warwick, Bermuda. He contributed frequently to leading periodicals and wrote *Inspiration of the Scriptures* (1869) and *Summary of Christian Doctrine* (1874).

PATUN. See JUANG.

PATUXENT. A river of Maryland, rising in Frederick County and flowing southeastward into Chesapeake Bay north of the Potomac (Map: Maryland, F 2). It is 90 miles long, and for the last 40 miles it is a navigable tidal estuary abounding in valuable oyster beds.

PATWIN, pà-twén'. See WINTUN.

PÁTZCUARO, pás'kwá-rō. A town of Mexico in the State of Michoacán, situated on the south shore of Lake Pátzcuaro, 38 miles southwest of Morelia (Map: Mexico, H 8). It is irregularly built, with narrow, crooked streets,

but is very picturesque in appearance, being surmounted by a church built on the top of a high hill. It is noted for the manufacture of fine furniture and beautiful featherwork. Pop., 1900, 7621; 1910, 5433. Patzcuaro is supposed to have been the Tarasca Indians' ancient capital.

PATZUM, pát-soom'. A town of the Department of Chimaltenango, Guatemala, 33 miles west of the city of that name (Map: Central America, B 3). The chief industry is wool weaving, and in the vicinity coffee, sugar cane, grain, and cotton are produced in abundance. Mines of silver, antimony, lead, and coal are found near by. Pop. (est.), 6964.

PAU, pò. The capital of the Department of Basses-Pyrénées, France, on the Gave de Pau, 105 miles south of Bordeaux (Map: France, S., D 5). It occupies a rocky height, cloven in two by a ravine and united by a high bridge. Towards the south unfold magnificent views of the western Pyrenees. Among its chief buildings are the two Gothic churches of St. Martin and St. Jacques, a palace of justice, a beautiful theatre, a museum, a public library containing 75,000 volumes, and a winter palace built in 1896 in Beaumont Park. The château of Henry IV, erected in the fourteenth century on the site of an older castle, dominates the town and contains sculptures, tapestries, and other memorials of the kings of Navarre. A striking marble statue of Henry IV stands on the Place Royale in the centre of the town. There are linen, cloth, and leather manufactures and a trade in Jurançon wine, grain, marble, and leather. Many swine are fed in the vicinity, and from the pork the famous *jambons de Bayonne* are made. Pau is a favorite resort for those who wish to explore the Pyrenees. Pop., 1901, 34,268; 1911, 37,149. Founded in the tenth century, Pau became important as the residence of the sovereigns of Navarre in the fifteenth century.

PAU, PAUL (1848-). A French general, born at Montélimar. He graduated from the Military Academy of Saint-Cyr in 1867. When the Franco-Prussian War broke out in 1870, he was a lieutenant of infantry, stationed at Châlons. On August 6 of that year, at Woerth, his right wrist was shattered so that the arm had to be amputated. Three months later he was promoted to captain, in 1871 had to spend some time in a hospital at Besançon, then returned to the front, and was decorated with the cross of the Legion of Honor. After Pau became brigadier general in 1897, he was given command of the forces at Montpellier. Highly popular as well as distinguished, at the opening of the European War in the summer of 1914, he was given important commands in Alsace. In 1915 he was sent on a diplomatic mission to Russia, the Balkan states, and Italy. With Joffre, the generalissimo, Foch, and Gallieni, Pau is to be ranked as one of the great French military figures of his day. He declined the post of Chief of the General Staff before it was offered to Joffre (1911). In contrast to the latter Pau became known as a strong clerical. See WAR IN EUROPE.

PAUER, pou'ér, ERNST (1826-1905). An Austrian-English pianist and writer on music, born at Vienna. He studied there with Dirzka, Sechter, and the son of Mozart, and at Munich with Lachner. He directed musical societies in Mainz from 1847 until 1851, when he went to London, but did not sever his conti-

mental connections and gave concerts in Germany and elsewhere. He became a professor at the London Royal Academy of Music in 1859 and was made Austrian court pianist in 1866. In 1867 he was made principal professor in the National Training School and from 1883 to 1896 held a similar position at the Royal College of Music. He was appointed musical examiner at Cambridge in 1879. From 1870 he gave musical lectures throughout Great Britain upon the history of music and kindred subjects, with pianoforte illustrations. In 1896 he retired to his villa at Jugenheim, near Darmstadt, where he died. He fathered German music in London, and to the Augener editions he contributed *Old English Composers for the Virginal and Harpsichord* as well as the Bach, Handel, Schumann, and other classical and romantic selections. Some of his own studies are included in the series of 100 called *The New Gradus ad Parnassum*, which he published. His compositions include, besides three operas, a symphony, quartet, quintet, songs, and pianoforte solos. He was the father of Max Pauer.

PAUER, MAX (1866-). An English pianist and teacher. He was born in London, studied under his father, Ernst Pauer (qv.), until 1881, and under V. Lachner at Karlsruhe until 1885, and thereafter appeared in concerts in London and on the Continent. In 1887-97 he was also professor of pianoforte at the Cologne Conservatory and afterward taught at the Stuttgart Conservatory, being chosen its director in 1908. In 1893 he was appointed chamber musician to the Grand Duke of Hesse. His first American season of 1913 proved a series of triumphs. He appeared in numerous recitals and with almost all the great symphony orchestras. The possessor of a rare combination of the poetic and intellectual qualities, he rendered works of widely different styles in a manner above criticism.

PAUL. The apostle of Jesus Christ who was specially commissioned to work among the Gentiles. The sources from which we secure our knowledge of his life and work are his own Epistles and the Book of Acts. From these it is clear that the condition of the Church when he came to the full prosecution of his work was one which rendered that work not only most significant for the future development of the Church, but most revolutionary to the ideas which the Church's leaders entertained as to what that development should be. These leaders were the Apostles who had formed the nucleus of Jesus' discipleship during his ministry on earth. They were men of limited education and with no great breadth of religious ideas. As a consequence their views of the necessary development of Jesus' religion practically restricted it to a reforming of Judaism in accordance with Jesus' teaching, and, as this reformed Judaism went out in a new evangelism to the world, it involved the bringing of the world into this religion through the gateway of Judaism. In view of their Palestinian training and experience these views were perfectly natural for the Apostles to entertain, but they were also clearly impossible for the Church to carry out if the religion of Jesus was to realize for itself that world-wide development which the Gospels show us Jesus himself intended it should have. It was at this latter point that Paul through his work and teaching introduced into the Church new conceptions which virtu-

ally revolutionized its ideas and made possible for Christianity its development as a universal religion.

Paul's original name was Saul; he was a native of Tarsus, an important city of considerable culture and refinement, in the Province of Cilicia (Acts xxi. 39), where he was born of Jewish parents about the beginning of the Christian era (Acts xxiii. 6; 2 Cor. xi. 22). His primary education was received probably in the synagogue school at Tarsus, where he lived until he had learned his trade of tentmaker (Acts xviii. 3). But while still quite young, perhaps not more than 15 years of age, he was sent to Jerusalem to be educated in the Rabbinic schools of that city, having as his teacher in the sacred Law the liberal-minded Gamaliel (Acts xxii. 3; see GAMALIEL). According to his own testimony he threw his whole heart into all that was taught him there, becoming one of the strictest members of the sect of the Pharisees and having no conception of salvation beyond that to be obtained through a perfect performance of the works of the Law (Gal. i. 14; Acts xxii. 3, xxvi. 4-5; Phil. iii. 4-6).

In time he became one of the more important of the younger Rabbinic students in Jerusalem, although it is not likely that he was actually a member of the Sanhedrin (Acts xxvi. 10 does not necessarily imply this). Whether he ever saw Jesus, or, in particular, was present at his trial and crucifixion, must remain uncertain. Apparently he was not seriously concerned with the new sect called Nazarenes until the preaching of Stephen showed that it was in reality a new system of belief and likely to become hostile to the existing Jewish system. Into the persecution which this produced he threw himself with energy, participating actively in the death of Stephen (Acts vii. 58; viii. 1) and following up this assault with a rigor of inquisition that made him notorious among the persecutors of the infant Church (Acts xxii. 4, xxvi. 9-11; Gal. i. 13-14). In the year 34 or 35, however, while nearing Damascus on a journey undertaken for the purpose of searching out the disciples in that place and bringing them bound to Jerusalem, he went through the experience of a supernatural vision that brought him to a deep conviction of the sinfulness of the course he was pursuing (Acts ix. 1-9). Out of this state of soul he became a Christian disciple, profoundly convinced of the Messiahship of Jesus and distinctly conscious of having received from his Master a commission to preach his religion among the nations of the earth (Acts ix. 10-18; Gal. i. 15-16).

This mission, however, he did not immediately carry out, but for the greater part of three years was in retirement in Arabia (Gal. i. 17). The purpose of this withdrawal it may not be possible definitely to determine, though, from the contrast in which he places it to the alternative course of conference with the Apostles at Jerusalem, it would seem that primarily it was for the sake of meditative thought upon the spiritual revolution which had taken place in his life. In fact, the acceptance of the crucified Jesus as the Messiah necessitated a complete recasting on Paul's part of his whole system of theology. At the same time it cannot be doubted that he availed himself of such opportunity of practical work as the region afforded (Gal. i. 15-23).

Upon his return to Damascus and Jerusalem he began to preach his new-found faith, evidently with some fuller conception of the Gentile direction of his mission than he had had immediately after his conversion (Act ix. 19-22), especially in Jerusalem, where he singled out the Greek-speaking Jews, disputing with them, doubtless largely along the lines of the Messiahship of Jesus (Acts ix. 28-29; xxii. 18). His chief motive, however, in going back to Jerusalem at this time was to visit the Apostle Peter, doubtless to learn from the lips of Jesus' foremost disciple the chief facts of Jesus' ministry and his main teachings (Gal. i. 18 f.). The bitter hostility of the Jews, who now looked upon Paul as a traitor, made it impossible for him to remain longer or carry on an active ministry in Jerusalem. In consequence of a vision to this effect he left the city and gave himself to work among the more distant Gentiles (Acts xxii. 17-20).

All that we know of Paul's next move is given in his own brief statement, "afterwards I came into the regions of Syria and Cilicia" (Gal. i. 21). After some time he found himself back in his native Tarsus, whence he was summoned by his old friend Barnabas to give his aid and assistance in the development of the new effort to evangelize the Gentiles which had recently shown itself in Antioch, the populous capital of Syria (Acts xi. 21-28).

Antioch now became the place of Paul's labors, and here his conspicuous abilities and zeal soon gave him a place among the leaders of the rapidly growing church of Antioch. Approximately 10 years had now passed since his conversion, during which time Paul had had ample time to mature and test his fundamental theological views. He was now sure of his position, and it was probably due to him more than to any other human agency that the first distinctive mission to the Gentiles was undertaken (Acts xiii. 1-3). The remarkable success of this mission (47-49 A.D.) brought Paul at last to a consciousness of the full meaning of his Gentile commission (Acts xiii. 44-48) and also brought the Church to a full realization of the significance of this new departure. In fact, upon their return to Antioch, Paul and Barnabas were confronted with a grave and serious problem. Parties representing the extreme Jewish element in the mother church came to Antioch insisting upon the need of circumcision in order to salvation. This was so contrary to Paul's fundamental conception of salvation by faith that surrender was impossible, and under the advice of the local church the controversy was carried up to Jerusalem for submission to the Apostles and Elders there (Acts xv. 1-2). A clear understanding of the resultant council and the position in it of Paul and Barnabas on the one side, and the leaders of the Church on the other, can only be secured by recognizing the development through which Paul's work had gone from his own original conception of it, and especially from the original conception of it held by the Jerusalem church. That Paul had the fundamentals of his theology from the time of his conversion may be accepted, as far as our records give any light; that these fundamentals included a clear conviction of the principles of justification by faith is almost necessary, if Paul's theology is to be understood as in any sense self-consistent—for this principle is practically essential to his

thinking. But while Paul may have possessed the principle of his theology from the beginning, it is manifestly clear that the practical experiences of his work had an effect upon the application which he gave to these principles. Few greater experiences, however, did he go through in his work than that of the wholesale conversion of the Gentiles during his first mission tour. These experiences must have given the decisive seal to his conviction of justification by faith and also must have widely broadened the application of that principle in the direction of the universalizing of the gospel beyond the bounds of Judaism. If, however, such was the influence of this experience upon Paul's own views, its effect upon the slower and more conservative views of the Jerusalem church must have been even more significant. Treasuring as they did the Jewish origin of Jesus' religion and the Jewish character of his discipleship, this wholesale ingathering of the uncircumcised Gentiles naturally seemed to them to herald the doom of the Church.

From such a situation it was inevitable that there should come dispute and controversy. The extremists on the side of the Jerusalem church insisted on circumcision—the distinctive feature of ceremonial Judaism—as necessary to salvation and acceptance within the Church. Paul and his followers insisted on the freedom from this rite given by the essential principle of justification by faith. It was the determination of this contention, in the light of the practical results of the first mission tour, that constituted the real question before the Jerusalem Council; and the decision which was reached to grant the Gentiles, with a few unessential provisos, full freedom from the ceremonial law was a result which was not only a triumph for the views of Paul, but the salvation of the Church itself. For, in spite of the conviction of the Jerusalem leaders, the Church's future lay beyond Judaism and could be reached only as the way to Christ was no longer obstructed by the forms which Judaism imposed. It was his profound conviction of the importance and vital character of the issue at stake that moved Paul to write so earnestly of the controversy in his Epistle to the Galatians (ii. 1-10).

From this council Paul and Barnabas returned to Antioch, and soon afterward (in 49 A.D.) Paul, having disagreed with Barnabas on some matters of their practical work, took with him Silas, who had come down with them from Jerusalem, and started upon his second missionary tour (Acts xv. 30-40). On this tour he first revisited the churches established at an earlier period in Syria and Cilicia as well as those founded on his first journey. From one of these latter churches he secured Timothy to be a helper in his work. From Antioch in Pisidia he essayed to go farther westward into the Province of Asia, but, being divinely forbidden, he turned northward with a view of entering the Province of Bithynia, but, his way again altered by the Holy Spirit, he at last arrived at the seacoast town of Troas in the old classical region of Troy (Acts xv. 41-xvi. 8).

It is probable, from his general policy of selecting the large city centres for his work, that Paul's purpose in this further extension of his journey beyond Antioch had been to go to Ephesus and, when forbidden to preach there, to go northward to Byzantium, which at that time was within the Province of Bithynia. The

divine prevention of this policy, confusing though it was, left him naturally convinced that the Master had for him some distinctive mission to perform. He was consequently in a receptive mood for the vision which came to him at Troas and called him across the water to Macedonia.

In obedience to this divine direction he entered upon his first European mission, passing down along the commercial highway that gave him entrance at the important towns of Philippi, Thessalonica, and Berea and finally brought him to Athens and Corinth (Acts xvi. 9-xviii. 1). At all of these places, as far as Corinth, his mission efforts had been somewhat disappointing, either having been broken off by persecution or, as was the case at Athens, received with indifference and contempt. As a consequence he came to Corinth (spring of 50 A.D.) in a despondent frame of mind (1 Cor. ii. 3). Here, however, his work was greatly blessed, and for a year and a half he and his companions remained in that region establishing churches, not only in Corinth itself, but throughout the Province of Achaia (Acts xviii. 2-11; 2 Cor. i. 1). It was during the early part of his stay in Corinth that, anxious for their welfare in the face of persecution, corrupting influences, and false teachings, he wrote his two letters to the Thessalonians, generally considered the earliest of his preserved writings (See THESSALONIANS, EPISTLES TO THE). From Corinth Paul returned (fall of 51 A.D.) by sea to Syria, stopping on the voyage at Ephesus long enough to preach in the synagogue and make promise of a return for more extended work. Landing finally at Cæsarea, he went up to Jerusalem with greetings to the Church and then returned to Antioch (Acts xviii. 18-22).

After some time spent there he set out upon his third mission tour (about 51-55 or 52-56 A.D.), visiting again the churches of southern Asia Minor, and then in fulfillment of his promise he proceeded on to Ephesus. At this large centre of activity and influence he remained at work for the greater part of three years, carrying the gospel, either personally or through his helpers, throughout the entire seacoast Province of Asia (Acts xviii. 23-xix. 20, xx. 17-35; 1 Cor. xvi. 19). During this period he was in frequent communication with the church of Corinth, whose problems of organization, Christian brotherhood, and moral life necessitated serious attention on the part of the Apostle. This produced considerable correspondence, portions of which are preserved in his Corinthian Epistles. It is quite clear that late in this period, in consequence of what seemed an urgent necessity, he made a hurried trip from Ephesus to Corinth by the direct route across the sea. The purpose of the visit was apparently to curb the rebellious and disorderly spirit of some of the members of the Corinthian church who were not only guilty of moral wrongdoing, but in a defiant and unrepentant mood. The visit was quite brief and resulted in a practical failure to straighten out the situation. The Apostle returned to Ephesus with a heavy heart. (See CORINTHIANS, EPISTLES TO THE.) Soon after this Paul felt obliged to leave Ephesus because of disturbances occasioned by pagan resentment at his increasingly successful work. Meanwhile he had made one more effort to win back the loyalty of the church of Corinth by dispatching thither Titus with a very touch-

ing letter. While waiting to hear Titus's report before venturing to visit Corinth again, he decided to revisit the Macedonian churches established on his previous journey (Acts xix. 23-xx. 1; 2 Cor. i. 23-ii. 13). It is quite likely that during the progress of this work he received the startling news from the Galatian churches which occasioned his letter to them. (See GALATIANS, EPISTLE TO THE.) Titus rejoined him in Macedonia with the cheering news that the Corinthian church had repented of its unseemly and ungracious attitude. Full of joy, Paul wrote 2 Cor. i-ix, sending it at once by Titus and intending to follow as soon as circumstances permitted. Reaching Corinth in the late autumn or early winter of 54 or 55 A.D., he remained there three months (Acts xx. 1-3). During this time of comparative leisure and freedom from anxiety he wrote his letter to the church at Rome—a church he had not founded or seen, but to the visiting of which he looked forward with earnest longing, and largely to prepare them for this visit he sent them this important letter. See ROMANS, EPISTLE TO THE.

In the spring of 55 or 56 A.D. he left Corinth for Jerusalem with quite a company, who doubtless represented the churches that had been engaged for some time in gathering a contribution for the mother church of Jerusalem (Acts xx. 4; see also Rom. xv. 25 f.; 1 Cor. xvi. 1-4; 2 Cor. viii-ix). After a journey which was accompanied by some incidents of a foreboding nature, to all of which Paul's mind seemed resignedly receptive, he reached Jerusalem (Acts xx. 3-xxi. 15). His reception by the brethren of the church was full of Christian fellowship; at the same time it was clear that the leaders were deeply impressed by the growing alienation from Paul among the believing Jews. As a consequence they suggested that he carry out in the temple a certain course of ceremonial observance designed to show his respect for the Law of Moses and to disprove the charge that he everywhere urged its abandonment by the Christian Jews. This he willingly did; but his presence in the temple was made the occasion of a ferocious onslaught upon him on the part of certain Jews, which would have ended his life but for the intervention of the soldiers of the adjoining Roman garrison (Acts xxi. 17-32).

It is clear from this incident, as presented in the passage cited, that the head and front of Paul's offending in the eyes of the Jews was not so much his heralding of the Messiahship of Jesus as his denial of the continued obligation of the Mosaic Law. This is instructive as to the large significance of the controversy which ensued upon his first mission journey and which, in spite of the wise action of the Jerusalem Council, wrought itself into the Galatian and to a certain degree into the Corinthian churches. Paul's position as to the absolute essentiality of the principle of justification by faith alone apparently went to the heart of the whole problem of salvation as it was present before the early Church.

Having found it impossible to secure from the excited mob any idea of the offense of which his prisoner was guilty, and Paul himself asserting his rights of Roman citizenship, the chief captain of the guard, Claudius Lysias, summoned a council of the Sanhedrin and brought Paul before it for examination (Acts xxi. 33-xxii. 30). This gathering, however, resulting in nothing but disorder among the members of the court,

and, information having been brought of a desperate plot against Paul's life by a secret band of Jews, Claudius Lysias sent him away by night under heavy guard to Felix, the Roman governor or procurator of Judæa, whose official residence was at Cæsarea (Acts xxiii).

Paul's stay at Cæsarea, which lasted two years, was practically a continued commitment for trial. He was given a preliminary hearing by Felix soon after his arrival at Cæsarea and defended himself against the accusations of the high priest Ananias and certain of the elders from Jerusalem, who were accompanied by counsel. But, though the prosecution failed to make out their case, no decision was rendered by the governor (Acts xxiv. 1-23). Later Paul was summoned privately before Felix and his wife to speak "concerning the faith in Jesus Christ," but, though the Apostle "reasoned of righteousness, temperance, and the judgment to come" in such a way as to make a terrifying impression upon Felix, the fear was wholly transient; for Paul was returned again to prison, where Felix kept him during the remainder of his term of office, arranging frequent interviews with him, in hope of securing from the Apostle a bribe for his release. Finally, in order to please the Jews, he handed him over bound to his successor Porcius Festus (Acts xxiv. 24-27).

Almost immediately upon the arrival of the new governor the Jews renewed their charge against Paul, but failed to make out their case. When, however, the governor seemed about to follow in his predecessor's steps and ignore the evidence presented, suggesting that Paul go up to Jerusalem for another trial, the Apostle, on the basis of his rights of citizenship, transferred the case to Rome by appealing to Cæsar. Such action left the governor no further choice, though he took the opportunity of Agrippa's presence in Cæsarea to bring Paul once more into court and to have his case heard by his royal visitor (Acts xxv). In his defense the Apostle presented before Agrippa the course of his life and the grounds of his Christian hope, persuading the King, as he had in fact both governors, that there was no reason for his being retained in bonds (Acts xxvi. 1-31). Beyond such personal impressions, however, his plea was of no use, since his appeal to the Emperor made transportation to Rome obligatory upon the authorities (Acts xxvi. 32).

The voyage to Italy was begun in the fall of 57 or 58 A.D., being marked by disastrous experiences which resulted in shipwreck on the island of Malta (q.v.). There the company remained through the winter, continuing their voyage in the spring and reaching at last their journey's end at the Imperial capital some time in the early half of the year 58 or 59 A.D. (Acts xxvii. 1-xxviii. 14). Here Paul was cordially welcomed by the Christian brethren of the city and kindly received by the authorities, being allowed to reside under guard in his own hired house, with freedom of intercourse among his friends and liberty of preaching his gospel (Acts xxviii. 15-31). It was during this period of imprisonment that he wrote his letters to the Philippians, the Colossians, Philemon, and the Ephesians. Of these, Philippians and Philemon, especially Philemon, dwell upon the Apostle's personal relation to the readers, though the practical problems of Christian brotherhood and moral living emerge quite clearly in Philippians.

On the other hand, Colossians and Ephesians were intended to counteract doctrinal errors of a subtle nature involving a large element of nascent Gnosticism. This is especially true of Colossians; Ephesians, as an encyclical letter, emphasizing rather the principles of Christian solidarity in the membership of the churches. See the articles on the above letters.

It is a matter of considerable debate as to what was the outcome of this imprisonment at Rome. The opinion adopted by the present writer is that after two years Paul was brought to trial before Nero and on the absence of any real evidence against him was released. After this release he resumed his missionary labors, possibly being able at last to fulfill his long-cherished hope of preaching the gospel in Spain (cf. Rom. xv. 24). He also appears to have revisited his former fields of activity (Ephesus, Greece, etc.; cf. 2 Tim. iv. 9-20) as well as Crete, Epirus, and other places (cf. Titus i. 5; iii. 12). In the midst of these labors he was re-arrested and transported again as a captive to Rome. At his second trial he was sentenced to death and suffered martyrdom not later than the year 65. Previous to his second arrest he wrote the letter to Titus and the first letter to Timothy, both of which have to do almost wholly with the practical matters of Church organization and discipline. His second letter to Timothy was written after his reimprisonment at Rome, shortly before his death, and is practically his last word of personal counsel and encouragement to his trusted helper and friend. See the articles on these letters.

The picture of Paul stands clearly before us in the records which the New Testament gives—a man of education, if not of culture, for his time—a Roman citizen and yet a Jew, a student of the Scriptures, a zealot in the law, and withal a conscientious seeker for the way of life within the circle of its precepts—consequently an earnest persecutor of the disciples of Jesus until divinely convinced of his error, when all his energy and enthusiasm and loyal devotion were transferred to his new life and infused into his new work. In this new life and work, however, Paul manifestly remained a Jew. He did not conceive of his Christianity as having severed him from the Israel of God, but rather as having enabled him to realize the ideal of Israel's Godward relations. His doctrinal thinking consequently found its historical and logical background in the Old Testament, rising through its anthropology and its soteriology to its climax in its Christology. His doctrine of Christ controlled all the rest of his theology, and, as this doctrine was fundamentally experiential rather than theoretical, Paul's whole theological system is fundamentally experiential rather than speculative. In all his thinking he was intense and characteristically logical, though he often clothed his thought in the old Rabbinic forms which he had brought with him from the Jerusalem schools, and frequently yielded to the rhetorical impulses more or less belonging to his intensity of nature. He was not metaphysical, even in treating the profoundest themes, but practical in the extreme and sympathetic on broad and comprehensive lines. Though his position in the matter of relationship to ceremonial Judaism was not that of the Jerusalem leaders, his views came to dominate the Church, and he himself became the Church's leader in its world work. On the theology of the Church

since his day his influence has not been even. Conceived of as a completely formulated system, it may be said that during the centuries immediately succeeding the apostolic age Paul's theology largely if not completely disappeared, being revived in its doctrine of man and of salvation in the theology of Augustine and receiving again at these points its conspicuous restoration in the essential position of the Protestant Reformation. Since then these Pauline doctrines have come and gone with the rise and fall of that trend of thinking which may be termed Calvinistic. This is true, however, only of Paul's theology as systematized by theologians and then incorporated into formal dogmatic theology. On the other hand, the spiritual life of the Church has ever been most profoundly influenced and nourished by the rich spiritual treasures of vital religious experience disclosed in Paul's letters, and there is no reason to suppose that it will ever be otherwise.

Bibliography. For consideration of the sources (a) from the point of criticism: consult the New Testament introductions and the critical discussions referred to in articles on the Epistles and the Book of Acts; (b) from the point of exegesis: consult the commentaries referred to in these articles. For study of the times: Sir W. M. Ramsay, *The Church in the Roman Empire* (New York, 1894); C. Weizsäcker, *The Apostolic Age* (Eng. trans., London, 1894); Emil Schürer, *History of the Jewish People in the Time of Christ* (Eng. trans., 5 vols., New York, 1896; also 4th Ger. ed., 4 vols., Leipzig, 1901-11); Weber, *Jüdische Theologie* (ib., 1897). For study of chronology: C. C. Clemen, *Die Chronologie der paulinischen Briefe* (Halle, 1893); E. D. Burton, *Records and Letters of the Apostolic Age* (New York, 1895); Adolf Harnack, *Chronologie der altchristlichen Literatur*, vol. i (Leipzig, 1897). See NEW TESTAMENT CHRONOLOGY. For study of the man: F. C. Baur, *Paulus* (Eng. trans., London, 1873-75); Thomas Lewin, *Life and Epistles of St. Paul* (3d ed., ib., 1875); Ernest Renan, *St. Paul* (Eng. trans., ib., 1887); Sir W. M. Ramsay, *St. Paul the Traveller and the Roman Citizen* (3d ed., New York, 1898); Orello Cone, *Paul the Man* (ib., 1898); Ernest Renan, *The Apostles*, translated and edited by J. H. Allen (Boston, 1898); F. W. Farrar, *Life and Work of St. Paul* (new ed., New York, 1902); C. C. Clemen, *Paulus* (Giessen, 1904); Conybeare and Howson, *Life and Epistles of St. Paul* (complete and unabridged ed., 2 vols., New York, 1906); Heinrich Weinel, *St. Paul: The Man and his Work* (Eng. trans. by G. A. Bienemann, ib., 1906); Sir W. M. Ramsay, *The Cities of St. Paul: Their Influence on his Life and Thought* (London, 1907); J. M. Campbell, *Paul the Mystic* (New York, 1908); C. N. Johnston, *St. Paul and his Mission to the Roman Empire* (ib., 1909); George Matheson, *The Spiritual Development of St. Paul* (ib., 1909); A. T. Robertson, *Epochs in the Life of Paul* (ib., 1909); R. J. Fletcher, *A Study of the Conversion of St. Paul* (London, 1910); G. H. Gilbert, *The Student's Life of St. Paul* (New York, 1910); Eberhard Vischer, *Der Apostel Paulus und sein Werk* (Leipzig, 1910); J. R. Cohu, *St. Paul in the Light of Modern Research* (London, 1911); James Drummond, *Paul: His Life and Teaching* (ib., 1911); P. Gardner, *The Religious Experience of St. Paul* (New York, 1911); G. A. Deissman, *Paul* (Eng. trans., ib., 1912); James

Stalker, *Life of St. Paul* (new and rev. ed., ib., 1912); also A. C. McGiffert, *History of Christianity in the Apostolic Age* (rev. ed., ib., 1900). For study of Paul's teaching: consult the standard works on New Testament theology, such as those by Weiss, Beyschlag, H. Holtzmann, and, in particular, P. Feine (2d ed., Leipzig, 1911); also Albrecht Ritschl, *Entstehung der altkatholischen Kirche* (Bonn, 1857); Holsten, *Das Evangelium des Paulus* (Berlin, 1880-98); Otto Pfeiderer, *The Influence of the Apostle Paul on the Development of Christianity* (New York, 1885); R. J. Knowling, *Witness of the Epistles* (London, 1892); G. B. Stevens, *Pauline Theology* (New York, 1892); A. B. Bruce, *St. Paul's Conception of Christianity* (ib., 1894); B. W. Bacon, *Story of St. Paul: A Comparison of the Acts and the Epistles* (Boston, 1904); Sir W. M. Ramsay, *Pauline and Other Studies in Early Christian History* (London, 1906); W. P. Du Bose, *The Gospel According to Paul* (New York, 1907); Wilhelm Wrede, *Paul* (Eng. trans., Boston, 1908); J. G. Greenhough, *The Mind of Christ in St. Paul* (London, 1909); A. E. Garvie, *Studies of Paul and his Gospel* (New York, 1911); Albert Schweitzer, *Paul and his Interpreters* (London, 1912); Auguste Sabatier, *The Apostle Paul* (Eng. trans. by A. M. Heller, ib., 1912); Sir W. M. Ramsay, *The Teaching of St. Paul in Terms of the Present Day* (New York, 1913); A. C. Headlam, *St. Paul and Christianity* (London, 1913).

PAUL. The name of five popes.—**PAUL I** (Pope, 757-767), the brother of Stephen II, whom he succeeded. He was the candidate of the Frankish party, and as Pope maintained close relations with Pepin I, whose help he needed both against the Lombards and against the Greek Emperor, who had not given up his claims to the exarchate and the Pentapolis. Pepin, however, was constant in his support of the Pope and assured him a fairly peaceable possession of the ecclesiastical territory. Consult H. K. Mann, *Lives of the Popes*, vol. i, part ii (London, 1902).—**PAUL II** (Pope, 1464-71), Pietro Barbo. He was born at Venice in 1417, the nephew of Eugenius IV, to whom he owed his introduction to an ecclesiastical career. He was made Cardinal in 1440 and held a position of great influence under Nicholas V and Calixtus III. Pius II, however, did not regard him so favorably, and his election to the papacy as successor to Pius was largely due to the older cardinals, who had not been in sympathy with that pontiff. At the beginning of his reign he tried to form an alliance of Christian sovereigns against the Turks, but the circumstances of the time frustrated his purpose. He was obliged to oppose the claims of the French King, Louis XI, to absolute power, and demanded of him the repeal of the Pragmatic Sanction. He attempted to suppress the non-Christian or properly so-called humanistic Renaissance, especially by the dissolution of the Roman Academy, which had become a meeting place for the enemies of religion, and by severe penalties against the scholars who combined pagan doctrine with pagan immorality. Consult Mandell Creighton, *History of the Papacy*, vol. iv (New York, 1903), and Ludwig Pastor, *History of the Popes*, vol. iii (3d ed., London, 1910).—**PAUL III** (Pope, 1534-49), Alessandro Farnese. He was born in 1468, was educated in Rome by Pomponio Leto, and went to Florence, entering into close relations with the Medici. Alexander VI

made him Cardinal in 1493; later he became Bishop of Ostia and dean of the Sacred College. He held various important offices, twice representing the Pope during his absence as legate in Rome. He strongly advocated the calling of a general council and was a member of the commission appointed by Clement VII to consider the question. After his elevation to the papacy he vigorously pursued the reforming policy he had always advocated. He first summoned the council to meet at Mantua in 1536, then at Vicenza in 1538, and again at Mantua in 1542; but each time its assembly was prevented by the discord between Charles V and Francis I. It finally met at Trent in 1545. (See TRENT, COUNCIL OF.) Against Henry VIII of England he took decisive steps, finally issuing in 1538 the bull of excommunication and deposition prepared three years earlier. He took vigorous steps also for the suppression of Protestantism in Italy, reconstructing the Inquisition and establishing a strict censorship of books. (See INDEX.) The reproach of nepotism is brought against him. In 1545 he made his natural son, Pietro Luigi Farnese (born before his entry into priesthood), Duke of Parma and Piacenza. He did much for the stability of the Church and was as well a patron of art. He appointed Michelangelo architect in chief of the Vatican and of St. Peter's and provided for many great works. Consult Ludwig Pastor, *History of the Popes*, vol. viii (3d ed., London, 1908).

PAUL IV (Pope, 1555-59), Giovanni Pietro Caraffa. He was born at Naples in 1476. In 1494 he entered the service of the Curia and in 1507 was appointed Bishop of Chieti, in which see he labored most earnestly for the reformation of abuses and for the revival of religion and morality. With this view he established, in conjunction with several congenial reformers, the congregation of secular clergy called Theatines (q.v.) and was himself the first superior. It was under his influence that Paul III organized the tribunal of the Inquisition in Rome. On the death of Marcellus II in 1555, although in his seventy-ninth year, he was elected to succeed him. He enforced vigorously upon the clergy the observance of all the clerical duties and enacted laws for the maintenance of public morality. He established a censorship and completed the organization of the Roman Inquisition; he took measures for the alleviation of the burdens of the poorer classes and for the better administration of justice, not sparing even his own nephews, whom he banished from Rome on account of their corrupt conduct and profligate life. His foreign relations, too, involved him in much labor and perplexity. He was bitter in enmity against Charles and the Spaniards. He insisted on the restoration of Church property in England, a demand which Julius III had in the interests of peace refused to press, and recalled Pole, who had arranged the settlement; and on Elizabeth's accession declared her illegitimate and not entitled to the throne. He was embroiled with the Emperor Ferdinand, with Philip II of Spain, and with Cosmo, Grand Duke of Tuscany. Having condemned the principles of the Peace of Augsburg, he protested against its provisions. At home he was unpopular for his strictness and lack of tact. Consult Leopold von Ranke, *History of the Popes*, vol. i (London, 1908).—**PAUL V** (Pope, 1605-21), Camillo Borghese. He was born in

Rome in 1550. In his early life he was a distinguished canonist and theologian, and after the ordinary prelatical career at Rome he rose first to the post of Nuncio at the Spanish court and afterward to the cardinalate under Clement VIII. His pontificate is rendered memorable by the celebrated conflict with the Republic of Venice, into which he was plunged at the very outset of his career. The original ground of dispute was the question of the immunity of the clergy from the jurisdiction of civil tribunals. The Venetian Senate resisted the claim of the clergy to be tried by ecclesiastical tribunals, and further causes of dispute were added by a mortmain law, and a law prohibiting the establishment of new religious orders or associations unless with the sanction of the Senate. Each party remaining inflexible in its determination, Paul issued a brief, directing a sentence of excommunication against the Doge and Senate and placing the Republic under an interdict unless submission should be made within 24 days. The Senate persisted, and an animated conflict, as well of acts as of writings, ensued, in the latter of which the celebrated Fra Paolo Sarpi (q.v.) on the side of the Republic, and on the papal side Bellarmine (q.v.) and Baronius, were the leaders. Preparations were even made for actual hostilities; but, by the intervention of Henry IV of France, the dispute was accommodated and peace restored in 1607, although dissatisfaction afterward arose on the subject of the nomination of a patriarch. Paul's administration was vigorous and marked by the development of religious orders and missionary enterprise. He added to the splendors of Rome and the wealth of his own family. Consult his *Life* by T. A. Trollope (London, 1861), and Leopold von Ranke, *History of the Popes*, vol. ii (ib., 1908).

PAUL I, PETROVITCH (1754-1801). Emperor of Russia from 1796 to 1801. He was the son of Peter III and Catharine the Great. He underwent a vigorous training at the hands of his mother, and this served to harden and warp a nature which was by no means devoid of generous impulses. The memory of his father's violent death made him suspicious of all who surrounded him. During his mother's lifetime he was allowed no share in the government and with the exception of a journey abroad (1781-82) passed his time in brooding idleness on his estates at Gatchina. Catharine seriously contemplated the exclusion of Paul from the succession to the throne in favor of his son Alexander. Paul's reign began with fair promise, but speedily degenerated into an oppressive despotism which weighed alike on the court, the army, and the intellectual life of the nation. The system of police espionage was developed to a hitherto unparalleled degree, and swift punishment was visited on those unfortunate enough to arouse the slightest suspicion in the Emperor's diseased imagination. Nevertheless Paul I carried out a number of important reforms. He promulgated the new law of succession to the throne, which established the rule that the Russian throne should pass from father to son and to the eldest brother in case there was no son. In 1798 he prohibited the selling of peasants without land in the governments of Little Russia. In 1797 he prohibited the lords from working their serfs on holidays or more than three days a week. On his accession to the throne the peasants for the first time in Russian history were

admitted to take the oath of allegiance to the new sovereign. Paul also separated for the first time in Russian history the estates and incomes of the Imperial family from the estates of the state. Reluctant at first to enter the struggle against France, he finally joined the Second European Coalition against the French Republic in 1798, and in 1799 the Russian armies under Suvorov (q.v.) gained a series of notable victories over the French and drove them out of northern Italy. Bonaparte's astute diplomacy, however, succeeded in breeding dissension between the Russian Emperor and his allies. Paul's discontent was intensified by the conduct of England in refusing him possession of the island of Malta, to which he, as Grand Master of the Knights of Malta, laid claim. His opposition to England finally developed into open hostility and led in 1800-01 to the formation of the Northern Maritime League by Russia, Sweden, and Denmark against Great Britain. At home, meanwhile, Paul's despotism had become unendurable, and a conspiracy was formed by some of the highest officials about the court to bring about the Emperor's abdication in favor of his son Alexander. The leaders of the conspiracy were Count Pahlen, Count Panin, Prince Subov, General Bennigsen, and General Uvarov. Alexander knew all about the conspiracy and practically directed it. On the night of March 23, 1801, the Imperial palace was surrounded by the troops of Count Pahlen, while the conspirators, some 30 in number, broke into Paul's chamber and at the sword's point demanded that he sign the act of abdication. No certain knowledge exists of what then occurred, but it would seem that the Emperor, crazed with fear, attempted resistance, that a scuffle ensued, and that in the struggle Paul was killed. Of Paul's 10 children, Alexander and Nicholas ruled over Russia, while Constantine was a prominent figure during the reign of the latter. Consult: Kobeko, *Der Casarewitsch Paul, 1754-96* (Berlin, 1886); Brenemann, *Aus den Tagen Kaiser Pauls* (Leipzig, 1886); K. Waliszewski, *Paul I* (London, 1913).

PAUL, APOCALYPSE OF. See *APOCRYPHA, New Testament*.

PAUL, HERBERT WOODFIELD (1853-). An English biographer and historian, educated at Eton and at Oxford, where he was president of the Union and distinguished as a student. He became a barrister in 1878, and he sat in Parliament from 1892 to 1899 and from 1906 to 1909. His books include: *Men and Letters* (1901); *Life of Gladstone* (1901); *Matthew Arnold*, in the "English Men of Letters Series" (1902); *History of Modern England* (5 vols., 1904-06); *Lord Acton* (1904); *Life of Froude* (1905); *Famous Speeches* (1910).

PAUL, pouL, HERMANN OTTO THEODOR (1846-). A German philologist. He was born in Magdeburg, studied at Berlin and Leipzig, and in 1874 became professor in the University of Freiburg. In 1893 he was appointed professor of German philology at the University of Munich. His publications include: *Gab es eine mittelhochdeutsche Schriftsprache?* (1873); *Zur Lautverschiebung* (1874); *Kritische Beiträge zu den Minnesingern* (1876); *Zur Nibelungenfrage* (1877); *Mittelhochdeutsche Grammatik* (1881; 7th ed., 1908); *Deutsches Wörterbuch* (1896; 2d ed., 1908). He is best known in the United States by his *Prinzipien der Sprachgeschichte* (1880; 4th ed., 1909), translated into

English by Strong (1888) and retranslated with changes by Strong, Logeman, and Wheeler (1891). As editor of *Grundriss der germanischen Philologie* (1888-93; 2d ed., 1896-1900; rev. ed., 3 vols., 1901-09) he rendered valuable service to modern philology. After 1874 Paul, with W. Braune, edited the *Beiträge zur Geschichte der deutschen Sprache*, of which 15 volumes were issued during his editorship. His editions of Hartmann von Aue's *Gregorius* (Halle, 1873-76; 2d ed., 1910), *Kalewala, das Volksepos der Finnen* (1885-86), and of Walther von der Vogelweide (Halle, 1882; 2d ed., 1911) are also noteworthy.

PAUL, JEAN. See RICHTER, JOHANN PAUL FRIEDRICH.

PAUL, päl, (CHARLES) KEGAN (1828-1902). An English publisher and author, born at White Lackington, Somersetshire. He was educated at Eton and at Exeter College, Oxford, from 1853 to 1862 was a master at Eton, and, after 12 years as vicar of Sturminster, left the Church of England and later became widely known in the publishing business, from which he retired in 1899. He was the publisher of the monthly periodical, the *Nineteenth Century*, of the *International Scientific Series*, and of the works of several famous writers. As an author he is best known for his biographies and translations: *A Translation of Faust* (1873); *Life of William Godwin* (1876); *Letters of Mary Wollstonecraft* (1879); *Biographical Sketches* (1883); *Maria Drummond* (1891); Huysmans's *En Route* (1896); *Memories* (1899). In *Faith and Unfaith* (1891) Paul hinted at his own religious beliefs; he had left the Church of England for Positivism, but in his last years entered the Roman Catholic church.

PAUL, LEWIS (?-1759). An English inventor, of whose life very little is known. About 1729 he invented a pinking machine, and his acquaintance with Dr. Samuel Johnson seems due to the fact that Mrs. Desmoulins had learned pinking from him. Paul's important patent dates from 1738, and it is the earliest machine for the spinning of wool or cotton by two pairs of revolving rollers. The factories established at Birmingham and Northampton met with no success. Two other patents taken out by Paul were a carding machine (1748) and a spinning machine (1758). They seem to have been no more successful than the one first constructed, which, however, was the basis of Arkwright's invention.

PAUL, poul, OSKAR (1836-98). A German writer on music, born at Freiwaldau, Silesia. He was a pupil of Klingenberg at Görlitz, then of Plaids, Richter, and Hauptmann at the University of Leipzig, and after sojourns in different German towns he returned to Leipzig (1866) to give private lessons in harmony. Three years afterward he began to teach musical history in the conservatory of that city, and in 1872 he was appointed professor extraordinarius at the university. He founded and edited the periodical *Tonhalle*, which was merged into the *Musikalische Wochenblatt*; published Hauptmann's *Lehre der Harmonik* (1868); wrote *Geschichte des Claviers* (1869) and *Handlexicon der Tonkunst* (1871-73); and made the first German translation of Boëthius (1872).

PAUL, pöl, VINCENT DE. See VINCENT DE PAUL, SAINT.

PAUL, päl, VISION OF. See APOCRYPHA, *New Testament*.

PAULA, SAINT FRANCIS OF. See FRANCOIS OF PAOLA, SAINT.

PAUL AND VIRGINIA (Fr. *Paul et Virginie*, pöl'ä-vërzhé'né'). A well-known romance by Bernardin de Saint-Pierre (1788), the scene of which is laid in Mauritius, where the author had spent three years.

PAUL CLIFFORD. A novel by Bulwer-Lytton (1833). It is the story of a chivalrous highwayman in the time of the French Revolution.

PAULDING, HIRAM (1797-1878). An American naval officer. He was born in New York City, entered the United States navy as a midshipman in 1811, participated in the battle of Lake Champlain (Sept. 11, 1814), receiving a vote of thanks and a sword from Congress for his services, served under Commodore Decatur against the Barbary Powers in 1815, and in the following year was promoted to a lieutenantancy. He accompanied Commodore Porter on an expedition against the West Indian pirates in 1822-23, acting as first lieutenant of the *Sea Gull*, said to have been the first steamer ever used for purposes of war; served on the *Dolphin* in 1826 when that vessel was sent to the Mulgrave Islands in search of the mutineers of the American whale ship *Globe*; cruised in the East Indies, in command of the *Vincennes*, from 1844 to 1847; was in command of the Washington Navy Yard from 1851 to 1854; and from 1854 to 1857 was commander of the home squadron, at the time the highest position in the navy. For arresting the filibuster Walker (see WALKER, WILLIAM) at Greytown, Nicaragua, in December, 1857, he was relieved from command by President Buchanan, though the Republic of Nicaragua in recognition of his services presented him with a sword and a large tract of valuable land, which latter Congress did not allow him to accept. On the outbreak of the Civil War he was ordered to Washington to assist Secretary Welles of the Navy Department and in April, 1861, proceeded to Norfolk and destroyed the navy yard there. Having passed the age limit of 62 years, he was technically retired in December, 1861. In the following year he was promoted to the recently created grade of rear admiral, on the retired list, and subsequently was commandant of the New York Navy Yard from 1862 to 1866, in which position he rendered important services to the government by sending many vessels and thousands of men to the front; was Governor of the Naval Asylum in Philadelphia from 1866 to 1869, and was port admiral at Boston from 1870 to 1871. He published a *Journal of a Cruise among the Islands of the Pacific* (1831). Consult R. P. Meade, *Life of Hiram Paulding* (New York, 1910).

PAULDING, JAMES KIRKE (1779-1860). An American author, born in Nine Partners, Dutchess Co., N. Y. After a scanty education he went to New York, where with William Irving, his brother-in-law, and with Washington Irving, he collaborated in *Salmagundi* (1807), the second series of the same (1819) being by Paulding alone. During the War of 1812 he published the *Diverting History of John Bull and Brother Jonathan*; and in 1814 the *United States and England*, a defense against British criticisms. This work attracted attention and caused him to be appointed secretary of the board of navy commissioners. In 1816 he published a defense of the Southern States and of

slavery in *Letters from the South, by a Northern Man*; in 1822, *A Sketch of Old England, by a New England Man*; and in 1824 *John Bull in America, or the New Munchausen*, a satire on the writings of British tourists. Meanwhile he had published his first novel, *Königsmarke* (1823). *Merry Tales of the Three Wise Men of Gotham* (1826) followed, and other books, mainly humorous and satirical. In 1831 he produced *The Dutchman's Fireside*, a novel dealing with the old Dutch settlers. This, his best work, was followed by *Westward Ho!* (1832), a novel dealing with Kentucky. Next came a good biography of Washington (1835) and *Slavery in the United States* (1836). Meanwhile he had been navy agent at New York City since 1825, a position from which he was advanced in 1837 to the post of Secretary of the Navy in Van Buren's cabinet. On his retirement in 1841 he went to a country residence at Hyde Park, where he wrote a few stories and plays, the novel, *The Puritan and his Daughter* (1849), being the most conspicuous. There he died, April 6, 1860. His select works appeared in four volumes (1867-68). Consult *Literary Life of James K. Paulding*, by his son William (New York, 1867).

PAULDING, JOHN (1758-1818). An American Revolutionary soldier, born in New York City. He, together with Isaac Van Wart and David Williams, captured Major André near Tarrytown, Sept. 23, 1780, and for this received from Congress a silver medal. He was a prisoner three times during the Revolutionary War, being released the second time only four days before André's capture.

PAUL-DUBOIS, pól-du'bwá', LOUIS FRANÇOIS ALPHONSE (1868-). A French economist, born in Paris. He attended the Lycée Louis-le-Grand and became a lawyer and referee of the Audit Office. Himself a son of the painter and sculptor Paul Dubois (q.v.), he married a daughter of the critic Hippolyte Taine (q.v.). He wrote: *Les chemins de fer aux Etats-Unis* (1896); *Les finances communales* (1898), which received the Faucher prize of the Academy of Moral and Political Sciences; *Frédéric le Grand d'après sa correspondance politique* (1902), awarded the Montyon prize by the French Academy; *L'Irlande contemporaine et la question irlandaise* (1907; Eng. trans., *Contemporary Ireland*, 1908).

PAULET, WILLIAM. See WINCHESTER, WILLIAM PAULET, MARQUIS OF.

PAULHAN, pó'lyán', LOUIS (1883-). A French aviator, who was early employed as a mechanic in a balloon factory. He won a prize for designing a model aeroplane, and by 1909, when he visited America, he had become generally known for successful flights. In April, 1910, he won the *Daily Mail* £10,000 prize for an aeroplane flight from London to Manchester. Paulhan became a lieutenant of reserve in the French Aviation Corps and participated in the military manoeuvres of 1910. On the outbreak of the European War (1914), he left his Riviera farm, where for two years he had been growing flowers for the London market, was sent to Serbia, and for bringing down an Austrian aeroplane was promoted captain in the flying corps.

PAULI, pou'le, REINHOLD (1823-82). A German historian. He was born in Berlin, studied there and at Bonn, and lived for several years in England, in antiquarian research and as

secretary to the Prussian Ambassador, Bunsen. In 1866 he lost his professorship at Tübingen because of an attack on the policy of Württemberg. In the following year he was appointed professor at Marburg and in 1870 at Göttingen. His historical works are marked by a lucid style and by painstaking research. They include: *König Aelfred und seine Stelle in der Geschichte Englands* (1851); a continuation of Lappenbergs *Geschichte von England* (1853-58), an able work; *Bilder aus Altengland* (1860; 2d ed., 1876); *Geschichte Englands seit den Friedensschlüssen von 1814 und 1815* (1864-75); *Simon von Montfort* (1867); *Aufsätze zur Englischen Geschichte* (Leipzig, 1869; n. s., 1883); and a sketch of Cromwell (1874). Pauli edited in 1856 Gower's *Confessio Amantis*.

PAULICIANS, pá-lí-sh'anz. An Oriental Christian sect, which flourished in the eighth and ninth centuries, although survivors are found much later. It has generally been represented as an offshoot of the Manichæans (see MANICHÆISM), but recent investigations make it probable that it is of independent origin. In a work entitled *The Key of Truth*, dating in its present form probably from the ninth century, and representing the contemporary usages and beliefs of the Paulicians in Armenia, survivals of ancient baptismal and ordination forms are found, which indicate some connection between this church and the older Adoptionists. The Adoptionists taught that Christ was a man who at his baptism became by adoption the Son of God instead of being so by nature or eternally (the Catholic doctrine). This type of Christology goes back to the end of the second century, when it was brought to Rome by Theodotus. (See MONARCHIANS.) The origin of the name Paulicians is uncertain, but an eleventh-century opponent of the movement traces it to Paul of Samosata (q.v.), Bishop of Antioch in the latter part of the third century, the last great Adoptionist teacher, and this is the most plausible derivation yet suggested. Ancient writers like Petrus Siculus and Photius (ninth century) say that Paulicianism arose in Armenia some 200 years before their time. Their leader was one Constantine (Sylvanus), and the sect stood in opposition to the catholicoi, or head of the national church, on several points of doctrine and practice. They rejected the authority of the hierarchy and chose religious leaders of their own, the "elect ones," wherein lies one resemblance between them and the mediæval Manichæan sects. These facts have led many writers to speak of them as "Protestants." In the ninth century the Paulicians enjoyed a vigorous ecclesiastical life, especially under a leader named Baanes, from whom they are sometimes known as Baanites, but they were subjected to severe and repeated persecution at the hands of the Church and of the Byzantine Emperors. Under such provocation they for a time joined forces with the Mohammedans against all Christian powers. In the eighth century and again in the tenth some of them were removed from Asia Minor to the upper part of the Balkan Peninsula, to serve as an outpost against the Slavic tribes of the north, and thus a considerable Paulician population was established in Europe. Their influence penetrated into Bulgaria, and here no doubt is one source of those mediæval movements generally classed as Manichæan, which include the Bogomiles, Cathari, and Albigenses (qq.v.), and may have influenced the

prereformation evangelical movements. A few surviving Paulicians were discovered in south-eastern Europe in the eighteenth century, and larger numbers of them in Armenia in the nineteenth. Here was found their book, *The Key of Truth*, which has thrown new light on some obscure points of their history. Consult: F. C. Conybeare, *The Key of Truth* (Oxford, 1898); A. H. Newman, *Manual of Church History*, vol. i (new ed., Philadelphia, 1900); H. F. B. Lynch, *Armenia, Travels and Studies* (2 vols., London, 1901); W. F. Adeney, *Greek and Eastern Churches* (New York, 1908); Edward Gibbon, *Decline and Fall of the Roman Empire*, vol. vi (ed. by J. B. Bury, London, 1912).

PAULINE EPISTLES. A group of New Testament letters claiming in their superscriptions to have been written by the Apostle Paul and comprising the following 13 writings: Romans, 1 Corinthians, 2 Corinthians, Galatians, Ephesians, Philippians, Colossians, 1 Thessalonians, 2 Thessalonians, 1 Timothy, 2 Timothy, Titus, Philemon. For detailed discussion, see the articles on the separate Epistles.

PAULINUS, MEROPIUS PONTIUS ANICIUS, SAINT (353-431). He was born at Bordeaux, France, and became a pupil of the poet Ausonius, who secured for him the favor of the Emperor Gratian. He attained the dignity of *consul suffectus* and married a wealthy Spanish lady named Therasia. Through the efforts of St. Ambrose he was converted to Christianity, distributed most of his property among the poor, and continued for a time to reside in Spain. He was ordained a priest in 393 at Barcelona, but soon left Spain for Rome. In 394 he went to Nola, where he had an estate. Near the city was the tomb of the martyr Felix, over which a church had been built, with a few cells for pilgrims. Here Paulinus lived for 15 years in a strictly monastic fashion, except that his wife seems to have been with him, as a sister. In 409 he was made Bishop of Nola, a position which he retained till his death. He was present at the Council of Ravenna in 419. Of his works there have been preserved 50 epistles, 32 poems, and a tract called *Passio S. Genesii Arelatensis*. His name is of frequent occurrence in the letters of Augustine and Jerome. The works of Paulinus will be found in vol. lxi of Migne's *Patrologia Latina* (Paris, 1861), and in vol. xxviii of the Vienna *Corpus Scriptorum Ecclesiasticorum Latinorum*. Consult Lagrange, *Saint Paulin de Nole* (Paris, 2d ed., 1882), and P. Reinelt, *Studien über die Briefe des heiligen Paulin von Nola* (Breslau, 1904).

PAULINUS, SAINT (died 644). A missionary sent in 601 by Pope Gregory I to England, where he joined Augustine (q.v.). In 625 he was made Bishop by Archbishop Justus of Canterbury and went to Northumbria, in attendance on Ethelburga, daughter of Ethelbert, King of Kent, and wife of Edwin (q.v.), King of Northumbria. Edwin was still a pagan at the time, but in 627, through the influence of his wife and Paulinus, he caused himself to be baptized, together with many others. Soon afterward Paulinus founded the cathedral at York. On the overthrow of King Edwin in 633 the Northumbrians relapsed into heathenism, and Paulinus fled to Kent, where he became Bishop of Rochester. He died Oct. 10, 644. Consult: William Bright, *Early English Church History* (Oxford, 1858); Alfred Plummer, *The Churches in Britain before A. D. 1000*, vol. i (London,

1911); Hugh Williams, *Christianity in Early Britain* (Oxford, 1912); *Cambridge Medieval History*, vol. ii (New York, 1913).

PAULISTS. The ordinary designation of the Congregation of Missionary Priests of St. Paul the Apostle. This is a society founded in New York in 1858 by Father Hecker (see HECKER, ISAAC THOMAS) and some other priests. Their desire was to form a community of priests for missionary work in America composed chiefly of those whose native tongue was English; Hecker and his companions had left the Redemptorists largely on the ground that the members of that order working in America were mostly of German birth and did not understand the needs of the country. The plan was approved by Archbishop Hughes and received the papal confirmation from Pius IX. The mother house of the community, most of whose members are converts from Protestantism, is in New York. The Paulists devote themselves especially to mission preaching and have been the main promoters of the remarkable movement originating in the last years of the nineteenth century towards a systematized effort to extend their faith among the non-Catholics of America, which has taken shape in the foundation of a central training house for such work at Washington. Their magnificent church in New York is noted for the perfection of its services, both in the direction of punctilious carrying out of the rubrics and of Gregorian music. They also carry on the Catholic Publication Society work, with a printing plant of their own, and publish a monthly magazine called the *Catholic World*. They numbered, in 1914, 64 fathers and had establishments in New York, Washington, Chicago, Winchester, Tenn., Austin, Tex., Portland, Oreg., and San Francisco. Consult N. A. Hewitt, *Memoir of the Life of Francis A. Baker* (7th ed., New York, 1889), and Walter Elliott, *The Life of Father Hecker* (ib., 1899).

PAULITES (ML. *Paulita*, from Lat. *Paulus*, Paul). 1. An order of hermits which arose in Hungary by the union of two earlier communities, those of Patach and Pisilia, under Eusebius of Gran, the founder of the latter, who united both of them in 1250 and became the first superior of the joint order. Eusebius died in 1270; the rule of St. Augustine was adopted in 1308, and the order, which was confirmed by Pope John XXII, spread throughout northern Europe until it numbered 170 cloisters in Hungary alone, in which country many of its members filled the highest ecclesiastical offices. In the political disturbances of the eighteenth century most of the houses were suppressed, but a few still exist in Galicia, Poland, and Cracow. 2. An order in Portugal, said to have been founded in 1420, whose constitution was approved by Gregory XIII in 1578. It was later suppressed. 3. An order in France, commonly called the Brothers of Death (see DEATH, BRETHREN OF), approved by Paul V (1620) and suppressed by Urban VIII in 1633. 4. Blind Sisters of St. Paul, founded in Paris in 1852 to assist blind women and children. 5. Sisters of St. Paul of Chartres, known as the Hospitaliers of Chartres. It was founded in the latter part of the eighteenth century, for the teaching and care of the sick and poor. It has spread to the West Indies and the Far East and the Philippines. Consult Max Heimbucher, *Orden und Kongregationen* (Paderborn, 1907).

PAULITSCHKE, pou-lieh'ke, PHILIPP VIKTOR (1854-09). An Austrian geographer and explorer of northeastern Africa. He was born at Tschermakowitz, Moravia, was educated in the universities of Graz and Vienna, and in 1889 was appointed docent in the University of Vienna. His first trip to Africa was in 1880, when he made ethnological studies in Egypt and Nubia; but the expedition undertaken in 1884, starting from Harar and going south through Somaliland, was much more important, especially as it covered new territory in Galla. Paulitschke's writings include: *Die geographische Erforschung des afrikanischen Kontinents von den ältesten Zeiten bis auf unsere Tage* (1876; 2d ed., 1880); *Die Afrika-Literatur von 1500 bis 1750* (1882); *Geographische Verkehrslehre* (1881; 2d ed., 1892); *Die geographische Erforschung der Adäländer und Harärs in Ostafrika* (1884); *Die Sudanländer* (1885); *Beiträge zur Ethnographie und Anthropologie der Somali, Galla und Harari* (1886); *Die Wanderungen der Oromó* (1888); *Ethnographie Nordostafrikas* (1893-96).

PAULLINIA, pgl-lin't-ä (Neo-Lat., named in honor of C. F. Paullini, a German botanist, 1643-1712). A climbing plant of the order Sapindaceae, native in Brazil, and sometimes called Brazilian cocoa. A paste made of the crushed seeds and leaves of *Paullinia sorbilis* or *Paullinia cupana* is called guarana and is used in medicine. The dried paste occurs in brown cakes or sticks, with an odor of chocolate and a bitter taste, partly soluble in water and in alcohol. It yields an alkaloid, guaranine, which is considered to be identical with caffeine (q.v.) and has the same therapeutic and physiological effects.

PAULMY, pôl'mé', MARQUIS DE. See ARGENTON, M. A. RENÉ DE VOYER, MARQUIS DE PAULMY.

PAULO AFFONSO, pou'lô äf-fôn'so, FALLS OF. See SÃO FRANCISCO.

PAUL OF MIDDELBURG (1445-1534). A Dutch mathematician, born at Middelburg, whence his name. He studied at the University of Louvain, took orders, became canon of St. Barthélemy at Middelburg, and also taught mathematics, medicine, philosophy, and theology there. He then went to Louvain, where he lectured on mathematics so successfully that the Grand Council of Venice offered him the chair of mathematics at Padua. By 1484 he was at the court of Francesco Maria della Rovere, Duke of Urbino, to whom he became physician and by whom he was appointed to the abbacy of Castel Durante. It was also at the instigation of the Duke that he was elected Bishop of Fossombrone in 1494. In 1513 he presided at the Fifth Lateran Council (1512-17), where he spoke on the necessity of a revision of the existing calendar, later undertaken by Gregory XIII. His publications include: *Practica de Parvis Constellationibus* (1484); *Epistola Apologetica Magistri Pauli de Middelburgo* (1487), in which he answers various objections raised by mathematicians against a revision of the Julian calendar; and *Paulinae de Recta Paschæ Celebratione, etc.* (1513), in which he demonstrates with much learning that, owing to defective reckoning, the Easter festival was frequently celebrated at a period a month earlier than that determined by the Council of Nice. Consult Baldi, *Cronica de' matematici* (Urbino, 1707), and De Paquot,

Mémoires pour servir à l'histoire littéraire de dix-sept provinces des Pays-Bas (Louvain, 1763-70).

PAUL OF SAMOS'ATA. Bishop of Antioch in the third century. Beyond the fact that he was born at Samosata, little is known of his early life. He was at first a sophist and obtained admittance among the clergy in some unknown way. He became Bishop of Antioch (260), probably through the influence of Zenobia, Queen of Palmyra. He was a Monarchian, and his opponents do not give a good account of him. They assert that his character previous to his appointment was in some respects unworthy of the episcopal office, and that after his elevation he was rapacious, arrogant, and vain. His heresies caused several councils to be convened to consider his case; by the last of these, held about 269, he was divested of his office and excommunicated. Trusting to the favor of both Queen Zenobia and the populace, he refused to vacate the episcopal residence, in which also the meetings of the Church were held. In 272 the Emperor Aurelian, having conquered Zenobia, restored Paul's case to the bishops of Rome and of Italy, and they decided against him. There is no notice of either the time or place of his death. Consult Adolf Harnack, *History of Doctrine*, especially vols. iii, iv (trans. from 3d Ger. ed. by Neil Buchanan, Boston, 1897, 1898).

PAUL OF THEBES, SAINT (ST. PAUL THE HERMIT) (c.235-c.347). The first well-known hermit in the Christian Church, called by St. Jerome the founder of monasticism. He was born at Thebes in Upper Egypt and at the age of 15 fled to the desert to escape the Decian persecution. Here he lived about 100 years in prayer and mortification and trained St. Antony to be his successor in the leadership of those who sought an ascetic life in retirement from the world. Consult Joseph Bidez, *Deux Versions Grecques inédites de la vie de S. Paul de Thèbes* (Ghent, 1900), and Nau, in *Analecta Bollandiana* (Brussels, 1901). See ANTONY, SAINT.

PAUL OF THE CROSS, SAINT (1694-1775). The founder of the Order of Passionists (q.v.). His original name was Paolo Francesco Danei, he was born at Ovada, near Genoa. With a few companions he began to live a hermit's life on Monte Argentario, where he believed that God revealed to him that he should found a new order, even showing him its destined habit. The Bishop of Alessandria after careful investigation clothed him with this habit and allowed him even as a layman to preach repentance and conduct spiritual exercises. In 1727 he was ordained priest, and 10 years later the first permanent settlement of Passionists was made on Monte Argentario; from this time the founder took the name of Paul of the Cross. After a life of penance and labor he died in Rome, Oct. 18, 1775. He was canonized by Pius IX in 1867. Consult his *Life* by the Passionist Father Pius (New York, 1867); R. P. Louis-Thérèse, *Histoire du Saint Paul de la Croix* (4th ed., Paris, 1888); C. P. Luke, *A Great Apostle of the Crucified* (Rome, 1878).

PAULOWNIA, pgl-lô'n'i-ä (Neo-Lat., named in honor of Anne Paulovna, daughter of Paul I, Czar of Russia). The common and generic name of an ornamental Japanese tree, *Paulownia tomentosa*, of the family Scrophulariaceae, which attains a height of 20 to 40 feet. It has some-

what the appearance of a catalpa, the heart-shaped leaves being similar but much more downy. The flowers, borne in panicles in spring, are fragrant, violet-colored, 2 inches long, somewhat cylindrical, with rounded lobes at the mouth. The tree was formerly much planted in the United States, but, not proving equal to expectation, has lost in popular favor. It is not hardy north of New York, and even there and farther south it often fails to bloom for several seasons in succession. The branches are crooked, spreading, and nearly horizontal. Since the large flower buds are carried over winter, severe cold generally blights them. The growth of the tree in a favorable climate is very rapid and vigorous, and it grows wild to some extent in the South. When annually cut to the ground, it is said to form a good hedge of young growths remarkable for the striking appearance of the leaves.

PAUL PRY. A comedy by John Poole, produced in 1825. The title character is an exceedingly curious, meddlesome person.

PAULSEN, poul'zen, FRIEDRICH (1846-1908). A German philosopher of the Neo-Kantian school. He was born July 16, 1846, at Langenhorn, Schleswig, and studied at Erlangen and at Berlin, where he became docent in 1875 and in 1878 professor of philosophy and pedagogy, and where his lectures were among the most widely attended in Germany. He died at Steglitz, near Berlin, Aug. 14, 1908. His chief works in education are "Gründung, Organisation und Lebensordnungen der deutschen Universitäten im Mittelalter," in Sybel's *Zeitschrift* (1881); *Geschichte des gelehrten Unterrichts auf den deutschen Schulen und Universitäten* (1885; 2d ed., 1896); *Realgymnasium und humanistische Bildung* (1889); *Höhere Schulen und Universitätsstudium im 20. Jahrhundert* (1901). As a philosopher Paulsen ranks as a disciple of Fechner in metaphysics, holding his pan-psychic doctrine and agreeing with him as to the parallelism between physical and mental. In general, his agreement with Fechner is best seen in the widely known *Einleitung in die Philosophie* (1892; 7th ed., 1900), of which an English version appeared in 1895 (2d ed., New York, 1907). His other works are: *Versuch einer Entwicklungsgeschichte der kantischen Erkenntnistheorie* (1875) and the supplementary work *Immanuel Kant* (1898; 2d ed., 1899; Eng. trans., New York, 1902); *Kant der Philosoph des Protestantismus* (1899); *Schopenhauer, Hamlet, und Mephistopheles* (1900), a series of essays; *Philosophia Militans* (1900; 2d ed., 1901); *Das deutsche Bildungswesen in seine geschichtlichen Entwicklung* (1906; Eng. trans., New York, 1908); *Ethik* (1889; 5th ed., 1899; partial Eng. version, 1899; new ed., New York, 1906); *Die deutschen Universitäten und das Universitätsstudium* (Berlin, 1902; Eng. trans., New York, 1906); *Richtlinien der jüngsten Bewegung im höheren Schulwesen Deutschlands* (1909).

PAULSEN, poul'sen, JOHN OLAF (1851-). A Norwegian poet and novelist, born at Bergen. He started life as clerk in the Portuguese consulate. In 1875 he published a collection of novels, *Af Bylivet*, which brought him recognition. There followed a collection of poems, *Moll og Dur* (1876), and the novel *Sjødronningen* (1876). Through Henrik Ibsen's recommendation he attained a stipend and went to live abroad. Among his many

novels are: *Dorothea* (1877); *Margherita* (1880); *Norsk Provinsliv* (1881); *Langt fra Norge* (1882); *Moderne Damer* (1883); *Kunstnervaturer* (1895); *Bergenske Originaler* (1904). *Nye Melodier* (1894) and *I September* (1897) are collections of poems. In *Mine Erindringer* (1900) and *Nye Erindringer* (1902) he tells in a pleasant way of his acquaintance with famous men and women in literature and art. Of importance in this field is his *Samliv med Ibsen* (1906).

PAULS VALLEY. A city and the county seat of Garvin Co., Okla., 56 miles south of Oklahoma City, on the Washita River, and on the Gulf, Colorado, and Santa Fe and the Atchison, Topeka, and Santa Fe railroads (Map: Oklahoma, D 4). It is the seat of a State training school for boys. Among the industrial establishments are a cotton compress and a bit and spur factory. The water works are owned by the city. Pop., 1900, 2157; 1910, 2689.

PAULUS, pou'lus, HEINRICH EBERHARD GOTTLÖB (1761-1851). A German theologian and one of the leaders of the Rationalist school. He was born at Leonberg, near Stuttgart, Sept. 1, 1761. He studied Oriental languages at Göttingen, London, and Paris. In 1780 he was called to the professorship of Oriental languages at Jena and in 1793 became professor of theology. Here he especially signalized himself by the critical elucidation of the Scriptures of the Old and New Testament on rationalistic principles. In 1811 he accepted the professorship of exegesis and ecclesiastical history at Heidelberg. He died Aug. 10, 1851. Among his numerous writings may be mentioned: *Clavis über die Psalmen* (1791); *Clavis über Jesaias* (1793); *Philologisch-kritischer und historischer Kommentar über das Neue Testament* (1800-04); *Sammlung der merkwürdigsten Reisen in den Orient* (7 vols., 1792-1803); *Leben Jesu, als Grundlage einer reinen Geschichte des Urchristentums* (1828); *Aufklarende Beiträge zur Dogmen-, Kirchen- und Religionsgeschichte* (1830); *Exegetisches Handbuch über die drei ersten Evangelien* (1830-33). He edited a collection of Eastern travels (1792-1803) and of Spinoza's works (1802-03). Consult Paulus, *Skizzen aus meiner Bildungs- und Lebensgeschichte zum Andenken an mein 50 jähriges Jubiläum* (Heidelberg, 1829), and Reichlin-Meldegg, H. E. G. *Paulus und seine Zeit* (Stuttgart, 1853).

PAULUS, pa'lus, JULIUS. A distinguished Roman jurist, who lived in the latter half of the second century and the earlier decades of the third. He was an assessor or associate justice under Papinianus, when the latter was prætorian prefect or chief justice of the Empire, in the reign of Septimius Severus; was exiled by Elagabalus, was recalled and made prætorian prefect by Alexander Severus. Paulus was one of the most fertile of Roman legal writers. In addition to commentaries on the civil law (16 books) and on the prætorian or equity law (78 books), he published a great number of monographs on special topics and 48 books of "questions" and "responses." He published also a succinct presentation of the entire law, civil and prætorian, under the title of *Sententiæ* (five books), and two books of "institutes" for beginners. He was regarded by the later Romans as the equal of his contemporary, Ulpian, and as inferior only to Papin-

ianus. His style, however, is less clear than Ulpian's. Excerpts from his writings make up more than one-sixth of the Digest of Justinian. A part of his *Sententia* has come down to us in the Breviary of Alaric (q.v.), and this text is included in Huschke, *Jurisprudentia Antejustinianæ quæ Supersunt* (4th ed., Leipzig, 1879). A fuller text, which includes the passages preserved in the Digest, may be found in Krüger, Mommsen, and Studemund, *Collectio Librorum Juris Antejustiniani* (Berlin, 1878-90).

PAULUS, LUCIUS ÆMILIUS. A Roman general. See ÆMILIUS PAULUS.

PAULUS DIACONUS (Lat., Paul the deacon) (c.720-c.800). The historian of the Lombards. He was descended from a noble family which had settled in Friuli. He received an excellent education either at Pavia or Friuli and was at the former city while King Ratchis (744-749) ruled there, and probably became the tutor of Adelperga, daughter of King Desiderius. For Adelperga he wrote his *Historia Romana*, which was chiefly a compilation of works still in our possession and was greatly used as a textbook for centuries after. The date when Paul entered the monastery at Monte Cassino is uncertain. In 782 he journeyed to the court of Charles the Great in order to obtain the release of his brother and other captive Lombards. His mission was successful, while he himself was induced by King Charles to remain and lend his aid in the reawakening of learning. It was here that he made his collection of homilies, known as *Homiliarium*, which have been translated into many languages. At the request of Bishop Angilram of Metz he also wrote *Gesta Episcoporum Mettensium* (History of the Bishops of Metz). Finally, after repeated petitions, Paul was permitted to return to his beloved convent, probably accompanying Charles to Italy in 786. At Monte Cassino Paul now wrote his most important work, *De Gestis Langobardorum* (History of the Lombards), which ends with the year 744. The work is remarkable on account of the number of poetic legends of the early Germans it has preserved. Paul was also the author of a number of theological works, and of some hymns and letters still extant. The best edition of his works is to be found in the *Monumenta Germaniæ Historica* (Hanover, 1878-79). Consult: August Potthast, *Bibliotheca Historica Medii Ævi*, vol. ii (2d ed., Berlin, 1896); Auguste Molinier, *Les sources de l'histoire de France*, vol. i (Paris, 1902). There is a German translation of the Lombard History with a serviceable introduction by Reinhard Jacobi in *Geschichtsschreiber der deutschen Vorzeit: Achten Jahrhundert*, vol. iv (2d ed., Leipzig, 1888), and an English translation by W. D. Foulke (Philadelphia, 1907), which has good bibliographical and other explanatory data.

PAULUS HOOK. See JERSEY CITY.

PAULUS OROSIVS. See OROSIVS, PAULUS.

PAUL VERONESE. See VERONESE, PAUL.

PAUMOTA (pā'ū-mō'tā), or **PAUMOTU, ISLANDS.** A group of islands in the South Pacific. See TUAMOTU.

PAUNCEFOTE, pans'fūt, **JULIAN**, first **BARON** (1828-1902). A British diplomat, born of English parents in Munich, Germany, Sept. 13, 1828. He was educated at Marlborough College, in Paris, and in Geneva, and was called to the bar in 1852. Three years afterward he became

private secretary to Sir William Molesworth, British Colonial Minister, and on the death of his chief, the following year, Pauncefote went to Hongkong, where he practiced law successfully, and in 1866 was made Attorney-General of the colony. He was appointed the first Chief Justice of the federated British Leeward Islands in 1874, knighted and made Assistant Undersecretary for the Colonies the same year, and in 1876 was given the corresponding position in the Foreign Office. He was made Permanent Undersecretary of State for Foreign Affairs in 1882, served as British Commissioner to Paris in the Suez Canal negotiations in 1885, and was appointed Minister to the United States in 1889. His title was changed to Ambassador when that office was created in 1893, and he was the first to bear that title in the United States. Queen Victoria made him an Imperial Privy Councilor in 1894. In the Bering Sea, the Venezuelan, and other difficulties between Great Britain and the United States, Pauncefote's large experience, knowledge, and tact in dealing with international affairs were powerful upon the conciliatory side, and his friendliness to the United States was shown in his efforts to have the Clayton-Bulwer Treaty (q.v.) abrogated. (See also HAY-PAUNCEFOTE TREATY.) In recognition of his services as a British delegate to the Peace Conference at The Hague in 1899, he was raised to the peerage as Baron Pauncefote of Preston. For many years before his death, which occurred at Washington, May 26, 1902, he had been dean of the diplomatic corps at that capital.

PAUPERISM (from Lat. *pauper*, poor). The condition of those who are partly or wholly dependent upon private charity or public aid for support. Technically, in law, a pauper is a person supported by the public authorities at the expense of taxpayers. In its broadest meaning the term "pauperism" should not be used synonymously with "poverty," or even with occasional acceptance of relief, but only to designate a state of chronic dependence. Pauperism is possible only in communities where extreme poverty and surplus wealth exist together, and in combination with a prevailing sentiment of pity. In primitive communities, where pity is lacking and the means of subsistence are often inadequate, the hopelessly ill and the aged as well as the irredeemably lazy starve or are put to death. In barbarian societies, where pity is still lacking, although some accumulations of wealth have appeared, weak or deformed children are commonly dispatched, while the aged receive scant consideration.

Chief among the more important causes of destitution in civilization are improvidence, sickness, accident, death of the head of the family, and old age. Charles Booth's investigations of English pauperism have shown that old age is, all in all, the chief cause. Destitution, however, may exist and yet pauperism be averted through a wise administration of private agencies of relief. Destitution at one end of the social scale, abundant means in the hands of kindly disposed but thoughtless givers at the other end, and sentimentality in public administration being given, destitution is rapidly converted into pauperism. In general we may say that improvidence, sickness, or other misfortune, and old age, are the causes of destitution, and that an unwise dealing with destitution is the great cause of pauperism.

History. On account of the simplicity of their economic life, great poverty was rare among the Jews. The care of the poor was left to custom and religion. The gleanings of the olive and vine orchards and of grain fields belonged to the widows and orphans. (Deut. xiv. 28-29; xxiv. 19-22; xxvi. 12-13.) Charity was, however, limited by racial lines, and there was little provision for the alien. Under Christianity there was a great development of charity. Men were to feed the hungry, give the thirsty to drink, clothe the naked, shelter the stranger, care for the sick, visit the prisoner. In the early Church the free gifts of the members were distributed by the bishops and deacons to those who were known by the members to be in need. Within the Church the situation seems to have been excellent.

Greece as early as Pisistratus provided for those wounded in battle. Later those unable to work (*dôuvatoi*), if they possessed property valued at less than about \$60, received from 1 to 2 obols per day (10 obols = 5 cents). As wages were 2 to 3 obols a day, the amount received must have sufficed for support. In Athens poor persons found shelter in houses without doors. There were in many cities unions (*êparoi*) which provided against poverty.

In Rome the donations of food and grain were for political effect, in part at least. Gaius Gracchus supplied Rome with grain at cost. Clodius gave it free to poor citizens, and in 33 B.C. the amount spent for grain was 10,000,000 sesterces, about \$433,000, which rose in 46 A.D. to sevenfold. Cæsar found 301,000 persons receiving grain and limited the number to 150,000, but this figure was exceeded under Augustus. The conditions which entitled men to grain were full citizenship and residence in Rome. Under Aurelius the donations consisted of bread, oil, and meat. From the time of Nerva emperors as well as private citizens gave funds for the education of children, as did Antoninus in honor of his wife, Faustina.

After Constantine great churches replaced the small communions, with the result that the effectiveness of the earlier charity of the Church was impaired. The Church received vast wealth, and great sums were given for the poor. Large institutions arose for widows and children. Rome and other cities were divided into districts in charge of deacons who dispensed alms. In Rome one-fourth of the goods was set apart for the poor. But the old voluntary offerings disappeared and donations came from the Church funds. After the fifth century the decline of charity is obvious, and beggars increased to an enormous extent.

During the Middle Ages the Church taught that almsgiving was a means of obtaining grace, but pauperism became too extensive to be adequately met by private charity. Charlemagne brought pressure on the bishops and lords to support the poor. In 779, a year of special need, he imposed a poor tax and expressly forbade begging. He also made arrangements for caring for widows, orphans, and strangers, but the system went to pieces at his death. The benefactions of the Middle Ages were numerous and varied. There were hospitals of all sorts for the aged sick, the criminal, the homeless, and for pilgrims; free baths; houses for the poor. The charitable orders were also well developed. But no systematic attempt was made to diminish pauperism. There was no discrimi-

nation between worthy and unworthy, the least deserving often receiving most. Great swarms of beggars arose and threatened to overrun Europe. (See MENDICANCY.) In the fifteenth century city authorities begin to take part in the relief of poverty. In 1437 Frankfort had city almoners. Cologne undertook some supervision of the poor in 1450, and Antwerp in 1458 had an Armenmeester. The city council became the guardian of orphans and the insane. But the measures taken to suppress mendicancy were regulative, in effect licensing it, and proved unsatisfactory.

Luther, in his letter to the German nobility, laid the foundations of a new policy. He advocated the control of poor relief by the cities. The relief should be limited to what was absolutely necessary, and should be given only after investigation; the worthy poor should be distinguished from tramps and impostors. In this scheme the idea of almsgiving as a means of salvation disappeared. Augsburg (1522), Strassburg, Breslau (1523), Regensburg, Magdeburg (1524), and other cities began a reorganization of poor relief. The question as to the relative spheres of church and state at once arose and was variously determined. In the main the old parishes formed the poor-relief districts. Efforts were made to gather the various funds into one treasury controlled by deacons (in Hamburg there were three deacons, in Lübeck 12), whose time of service was only one or two years. They were at first elected, but later on appointed, and they rendered yearly accounts. Alms were distributed to the poor at their homes, or occasionally given out at the church. Necessaries of life were sold at low rates. Labor was secured when possible. But the charges were too great for continued success and there were other handicaps. The short term of the deacons made systematic effort impossible; the existence of old orders and institutions caused cross currents, and the plans gradually failed.

The German development begins again after the Thirty Years' War. Edict after edict against begging came to naught, but some progress was made towards fixing the responsibility for support and in the regulation of marriage. By the end of the seventeenth century poorhouses and houses of correction appear. The teaching of Thomasius and of Gallert and the Pietist movement strengthened humane feeling, and in the writings of Garve, Resewitz, Rochow, and others a literature of poor relief appeared. Many patriotic and benefit societies were founded. In Hamburg (1788) the general poorhouse was created. Visitors (180) were appointed to gather information. The poor were given work, various trades were started at the poorhouse, and deficient earnings were supplemented. At first results were favorable. In the first 10 years the number of the poor in institutions sank from 9757 to 4751. In 1801, however, the institution had a deficit of \$15,000, which increased from year to year. In Prussia poor associations (*Armenverbände*) were organized and rules regarding the responsibility for support were adopted. Parishes had to support residents of three years' standing, those without legal residence being cared for out of special or general funds. Schools of industry appeared. Pestalozzi gave an impetus to special institutions for children, and institutions for the deaf and blind were founded. In Gotha

and Weimar children were boarded in families. The schemes adopted were, however, at that time impracticable and many were even demoralizing. Wages below a certain minimum were made good, though it was obvious that employers would lower wages to take advantage of this fact. The period of the wars also had a depressing effect. During the first 30 years of the nineteenth century begging increased. New laws were promulgated in Saxony in 1840 and in Prussia in 1842. The general law of 1870 affecting the German states, with the exception of Bavaria and Alsace-Lorraine, opened the way for the development of the poor relief of the different states according to local conditions. The Elberfeld system (q.v.) has found general adoption. This is in essence a combination of public and private charity, with unpaid visitors, assigned to special districts, who investigate each case, and the treatment is adapted to individual needs. There has likewise been a development of private associations. The Inner Mission (q.v.) has reintroduced the Church care for the poor, and the churches are beginning to organize, as is shown by the proceedings of the Eisenach Conference of 1892. The Catholic church has also been active, this church in general opposing poor relief by the state or at most merely admitting the right of the state to supplement private efforts. Germany has taken steps to do away with pauperism by the introduction also of compulsory insurance and old-age pensions (q.v.).

In Catholic countries the state has never assumed the leading rôle in poor relief. At Ypres in 1525 reform measures were introduced which raised a storm of religious opposition and were never fully carried out, although the Sorbonne ratified them. The Council of Trent took the old attitude, but in spite of this some princes attempted the supervision of hospitals as within their executive rights. There was, however, a great development of charitable institutions under the church. A Portuguese, Juan de Dio (1556), founded the Brothers of Charity and the modern hospitals, while Vincent de Paul is justly honored for his philanthropy and for the establishment of the Order of Sisters of Charity.

France has been the seat of the greatest development of the charity of the church. The administration of relief has been largely through the church, though some of the funds have been supplied by the state. Francis I ordered each church to care for its poor, the poor relief to be in the hands of the pastors and assistants, the funds to be derived from free-will offerings. In Paris (1544) a general poor office was created with power to levy a tax, and this tax was extended to all communes in 1566, which plan was followed until 1791. Edicts against begging were numerous and the penalties often severe, but to no purpose. Under the influence of Francis de Sales and Vincent de Paul many institutions were founded, and Louis XIV also was noted for his efforts in this direction. To supplement the hospitals, *dépôts de mendicité* were established in 1774, and in 1808 these were extended to each province, but they have since largely disappeared. In these labor was compulsory. In spite of the 2185 hospitals with an income of 38,000,000 francs listed by the *comité de mendicité*, in 1790 pauperism was a live question in France. By the time of the Revolution there was a strong demand for a reform

of the poor-relief system. The constitution of 1791 established the principle of state control and that of 1793 proclaimed that "society owes its unfortunate citizens support by offering work and by maintaining those incapable of providing for themselves." It was proposed to acquire the private institutions. Necker initiated new measures, opening, among other things, workshops in Paris, which only served to attract the poor from the country and thus increased the trouble. During the following years many schemes were inaugurated, but the net result was rather to cripple the old system than to establish anything enduring in its place. The church came again to control, subsidized by the state. The Sisters of Charity regained strength. In 1796 local boards (*bureaux de bienfaisance*) were established, but were not made compulsory. They exist to-day in only about one-third of the communes whose population is less than 500 and in perhaps two-thirds of those with a population of over 1000. Relief given is both at home (*secours à domicile*) and in the institutions. The state has assumed charge of the work for children and for the insane. The Revolution found large numbers of foundling hospitals (q.v.), and these increased until 1834, when restrictions were imposed and, instead of the reception through the tours, bureaux of admission were formed and the care of the children regulated. In 1869 a special department of the government was set aside for this work, and in 1874 extensive regulations relative to the boarding of children in private families were adopted. Since 1895 the law regulating medical care of the poor has made some changes, though effective institutions are lacking. The cost of public charity has greatly increased, but this is largely accounted for by the improved care given the poor rather than by great increase in the number of the dependent.

In Italy the mediæval system is most pronounced. Begging is almost universal, and there is little state control of pauperism. The Law of 1862 (*legge delle opere pie*), modified in 1890, established some state supervision over charitable corporations, but further development has been checked by the political situation. There are numerous institutions and endowed charities with funds aggregating \$4,000,000 or more.

In Austria poor relief is chiefly administered through the communes under the leadership of the priests. The system is known as the *Pfarrarmen Institut* (1782). The funds are obtained largely from private donations, and each commune supports its own poor, though there is no special tax for the purpose. In Lower Austria the Elberfeld system has been introduced since 1893, with some local taxation in case of emergency. Switzerland supports the helpless and provides work for the able-bodied pauper. After the freeing of the serfs Russia turned poor relief over to the local representative assemblies, which impose taxes for this purpose. In Norway and Sweden public charities are administered by the Established church. Belgium has almshouses with compulsory labor. Holland has a system of pauper or labor colonies (q.v.), which has won general favor. There exist also over 4600 associations for poor relief, many orphan asylums, and other institutions. In addition there are large numbers of private organizations and institutions.

Long before the Reformation England had unsuccessfully forbidden begging. No provision was made for the destitute until 1388 (12 Rich. II). In 1536 (27 Hen. VIII) each parish was ordered to care for its poor and provide work for the able-bodied. It soon became necessary to induce the people to give money for this purpose, and at first the bishop was to use "charitable ways and means" to persuade the unwilling donor. In 1563 it was decreed that the persistent refusal to give would bring one before the courts for punishment. A decade later a tax was levied for the poor, and public officials, overseers of the poor (q.v.), were created. In 1601 the famous Law of Elizabeth (43 Eliz., c. 2) was enacted and became the basis of subsequent public poor relief in England and the United States. Emphasis is laid upon the "setting to work" of the able-bodied. The overseers were given power to assess, collect, and distribute the rate, as the tax was called. They cared for and apprenticed orphan children. The unwillingness of any parish to support the poor of other parishes led in time to the development of strict settlement laws (14 Car. II, c. 12). Insistence upon "setting to work" of the able led to the establishment of the workhouse (then called the industrial house). The first one was founded at Bristol in 1697. In 1722 a general Act (9 Geo I, c. 7) authorized workhouses wherever needed. Any pauper refusing to go to the workhouse was denied assistance elsewhere. This gave rise to the distinction made in England and elsewhere between assistance given in an institution, technically called indoor relief, and that given at the residence of the recipient or outside of any public institution, outdoor relief. The introduction of the new institutions naturally gave rise to many abuses, and these, with the general humanitarian sentiment of the eighteenth century, tended towards a reaction. Under Gilbert's Act of 1782 the workhouses were largely given over to the old, the infirm, and to children, others receiving assistance outside of the institutions. Various parishes were allowed to form workhouse unions. By an Act of 1796 outdoor relief was again legalized. The famous Speenhamland Act, adopted in Berkshire in 1795, started the allowance system. A certain minimum of wages was considered necessary, and the difference between this and the amount actually earned was to be supplied by

a thorough investigation (1832-34), made a remarkable report (1833-34) showing a deplorable condition of affairs. Pauperism seemed to be contagious, and in some districts nearly all the able-bodied men were receiving allowances. In 1834 (4 and 5 Wm. IV) radical reforms were introduced. Outdoor relief was gradually withdrawn and limited as far as possible. Able-bodied men were refused assistance outside the workhouse. The population of the workhouses was classified. The sexes were separated and only plain necessities of life were provided. The functions of overseers had already been restricted to the collection of rates, and the distribution of relief had been given to boards of guardians. This arrangement was continued. A central body of commissioners was created, which became in 1847 the Poor Law Board. This body was abolished in 1871 and its powers were lodged in the Local Government Board, which is now the body controlling the general execution of the Poor Law in England and Wales. The results have been satisfactory. New unions were formed. Conditions within the workhouses have improved. Many children have been educated in the special workhouse schools, but there is a growing tendency to send them to the regular parish schools. In many districts children are boarded out in private families. When children are ready to support themselves they are apprenticed to various trades. The workhouses of the first half of the nineteenth century have grown into numerous special institutions for the insane, blind, and deaf and dumb, so that the workhouse of to-day is not the general dumping place of the infirm and unfit.

The amount expended in poor relief in England and Wales, including expenses of administration, was £44,589,726 for the three-year period from 1908-09 to 1910-11—an average of £14,863,242 annually. The figures show a constant tendency towards increasing expenditures for poor relief, the expenditure for the fiscal year 1899-1900 being £11,567,649 and that for 1910-11 £15,023,130. The following table showing the number of paupers in receipt of relief indicates a decrease in the number of indoor paupers since 1910 and of outdoor paupers since 1905. The decline in the former may be due in part to the grant of old-age pensions to persons who were already in receipt of relief by the Act of 1911.

ENGLAND AND WALES

JANUARY	INDOOR		OUTDOOR		INDOOR AND OUTDOOR	Insane	Total relieved
	Adult able-bodied	All others	Adult able-bodied	All others	Total		
1900	38,662	183,085	61,058	147,459	731,161	72,207	803,247
1905	50,757	214,992	81,932	493,681	845,362	83,816	924,630
1910	59,759	239,457	75,109	469,341	843,666	93,076	935,738
1911	58,308	240,569	74,575	424,445	797,897	94,985	891,807
1912	55,247	233,828	71,319	345,651	706,045	96,883	801,881
1913	53,601	230,002		411,525	695,045	99,062	794,227
1914	47,006	224,457		389,314	660,777	100,041	761,578

the state. This was extended by the Act of 1796. The expenditures for the relief of the poor rose from about £2,004,000 in 1775 to £4,267,000 in 1802 and to £7,890,000 by 1818. Such a rapid increase called for investigation. A commission authorized by Parliament, after

England has also witnessed a great development of private charity, of which little mention can be made here. The Friendly Societies (q.v.), the Charity Organization Society, the Salvation Army, and Dr. Barnardo's great work for children deserve mention. Attempts to pre-

vent pauperism have been made in cities by the destruction of slums, the building of tenements, and the opening of parks and playgrounds. Public attention has been directed to the question of old-age pensions (q.v.). The postal savings banks (q.v.) have been successful.

Scotland and Ireland have public relief patterned after that of England. In Scotland no relief is allowed to able-bodied adults. The relief is given by inspectors appointed by the parochial boards, which are under the oversight of the board of supervision.

Public relief of the destitute in the United States is based on the Elizabethan Law of 1601. The public duty to give relief is recognized. How this relief shall be administered is a matter for each State to determine. There is little uniformity. At first the almshouse, or poorhouse, was the only institution for the pauper. This was maintained by the town in New England, the county elsewhere. Many of the larger cities had and still have their own institutions. Here have been intermingled the worthy poor, the sick, insane, feeble-minded, children, mothers with illegitimate children. The nineteenth century witnessed the gradual development of hospitals for the insane, which can now provide for about 75 per cent of the insane who are public charges; of institutions for children in such numbers that there is no longer any excuse for the presence of children in almshouses; of hospitals for the sick; of schools for the deaf and dumb and blind; of schools for the feeble-minded, and, in the last decade, of special institutions for the epileptic. Reforms have usually been initiated by private organizations and then been adopted by the State, which has sometimes subsidized private institutions. There is a growing tendency, however, for the State to own and manage all institutions which shelter public charges. Outdoor relief is administered by township trustees under the County Board of Supervisors (in New England the town is the unit) in rural districts. The large cities usually are independent of the county. Chicago is a notable exception. Many cities grant outdoor relief, but some, such as Philadelphia and New York, do not. Mendicancy and vagrancy are forbidden by laws and ordinances, but these are not always enforced. Little attention has been paid to settlement until recently. Now some States are beginning to make inquiries and to send home those who are not properly dependent on them. In most States there is a public body, known usually as the State Board of Charities, which oversees the working of the charitable institutions of the State. Its members, with the exception of the secretary, who devotes his entire time to the work, are usually unpaid. Recently a few States have established a Board of Control, a smaller body of paid agents, to supervise institutions and sometimes to purchase their supplies. Destitute aliens are a State charge. Immigration of persons likely to become public charges is forbidden by Federal laws.

The United States has witnessed a great development of private beneficence. Most of the churches have funds for the relief of poor members, and there are large charitable institutions under denominational management. The growth since 1870 of the Charity Organization Society has helped to bring order out of the chaos in private relief. One of the chief aims of this society is to coordinate various agencies and

to prevent a duplication of effort. Since 1874 the National Conference of Charities and Correction, composed of philanthropists and workers in charitable and correctional institutions, has held annual meetings for the study of pauperism and allied topics, and its publications are valuable. See CHARITIES AND CORRECTION, NATIONAL CONFERENCE OF.

There are no complete statistics of paupers in the United States. The census of 1890 gave the number of inmates of almshouses as 73,045, and a special report of the Census Bureau of 1906 gives the number at 81,714, Dec. 31, 1903. A bulletin of the Census Bureau published in 1914 gives the number for Jan. 1, 1910, as 84,198. These figures take no account of the much larger number of persons receiving help who are not in institutions and the insane and other defectives who are cared for in public institutions, not to mention those supported by private associations.

No attempt has been made to give any comparative statistics of the extent of pauperism in the different countries. The conditions of relief are so diverse, and the census of paupers is so inadequate, that comparative statements are misleading.

Pauperism has no panacea. With every step in human progress a certain proportion of the population, discouraged or overwhelmed by misfortune through the breaking up of old industrial relations when new ones are established, falls behind in the race. Therefore each age and each nation must attack anew the problem of preventing an inevitable destitution from becoming a hopeless pauperism. Certain fundamental principles, however, have been well established by experience and may thus be summarized:

- 1 Indiscriminate almsgiving, without careful investigation of the situation and needs of the applicant, is a fruitful cause of pauperism instead of a remedy.
- 2 To remove the cause and to bring the individual to self-support, if possible, must be the aim of all efforts.
- 3 To accomplish this does are not sufficient, but carefully worked out plans must be adopted and carried through.
- 4 This necessitates an enduring organization of experts (either private or public) to superintend and execute the chosen methods. If success is to be obtained the various charities must work in cooperation with this central body to prevent imposture and duplication of efforts. (See CHARITY ORGANIZATION SOCIETY.)
- 5 The assistance given must be sufficient, but not enough to tempt the self-supporting workingman to surrender his independence.
- 6 In the words of Malthus, "It is in the highest degree important to the general happiness of the poor that no man shall look to charity as a fund upon which he may confidently depend."
- 7 Beggars should be put in institutions with labor adapted to their abilities.
- 8 Constructive efforts, such as the creation of family pride, assistance in securing work, removal of children from demoralizing surroundings, pay far better than any palliative measures.
- 9 The questions as to the sort of relief, in money or in kind, the agency, whether private or public, the place, whether at home or in institutions, are matters to be determined by local antecedents and local conditions.
- 10 For the physically or mentally feeble there must be furnished good care under decent surroundings, that which constitutes good care naturally vary-

ing from place to place and from time to time. 11. It is recognized as desirable, no matter what system of relief prevails, that there should be voluntary, unpaid coöperators to lessen the danger of officialism. See CHARITIES; MENDICANCY; OLD-AGE PENSIONS; POOR LAWS.

Bibliography. The books and articles treating of pauperism are almost numberless. Reference is made only to a few of the more important sources.

Ancient and Mediæval: Monnier, *Histoire de l'assistance publique* (Paris, 1866); Hirschfeld, *Die Getreideverwaltung in der römischen Kaiserzeit* (Göttingen, 1869); Uhlhorn, *Die christliche Liebesthätigkeit in der alten Kirche* (Stuttgart, 1880; Eng. trans., Edinburgh, 1883); Moreau-Christophe, *Du problème de la misère et sa solution chez les peuples anciens et modernes* (Paris, 1881); Ratzinger, *Geschichte der kirchlichen Armenpflege* (Freiburg, 1884), written from a Catholic standpoint; Uhlhorn, *Die christliche Liebesthätigkeit im Mittelalter* (Stuttgart, 1884); id., *Die christliche Liebesthätigkeit seit der Reformation* (2d ed., ib., 1895).

Modern Europe: Emminghaus, *Das Armenwesen und die Armengesetzgebung in den europäischen Staaten* (Berlin, 1870; Eng. trans., London, 1873); Rocholl, *System des deutschen Armenpflegerechts* (Berlin, 1873); Reitenstein, *Die Armengesetzgebung Frankreichs* (Leipzig, 1881); Du Camp, *La charité privée à Paris* (Paris, 1886); Böhmert, *Des Armenwesens in 77 deutschen Städten* (Dresden, 1886); Hubert-Valeroux, *La charité avant et depuis 1789* (Paris, 1890); Bodio, *Atti della commissione reale per l'inchiesta sulle opere pie* (Rome, 1895).

England: *Extracts from the Information Received by his Majesty's Commissioners as to the Administration and Operation of the Poor Laws* (London, 1833); Nicholls, *History of the English Poor Law* (ib., 1854; vol. iii by Mackay, ib., 1899); Ribton-Turner, *History of Vagrants and Vagrancy* (ib., 1887); William Booth, *In Darkest England and the Way Out* (New York, 1890); Charles Booth, *Life and Labor of the People* (10 vols., London, 1891-1903, a monumental work, dealing chiefly with conditions in the East End of London); id., *Pauperism and the Endowment of Old Age* (ib., 1892); id., *The Aged Poor in England and Wales* (ib., 1894); Robert Hunter, *Poverty* (New York, 1904); McCarthy, *The Causes of Poverty* (London, 1908); B. S. Rowntree, *Poverty: A Study of Town Life* (new ed., New York, 1910); S. and B. Webb, *The Prevention of Destitution* (ib., 1912); Ashby, *One Hundred Years of Poor Law Administration in a Warwickshire Village* (Oxford, 1912).

United States: *Report of the Special Committee on Outdoor Alms of the Town of Hartford* (Hartford, 1891). This account of American conditions is unique in the American literature of the subject and ranks in value with the *Report of the Poor Law Commission of 1833-34*. Consult also: National Conference of Charities and Correction, *Annual Reports* (Boston, 1874 et seq.); Brace, *The Dangerous Classes of New York* (New York, 1880); C. R. Henderson and others, *Modern Methods in Charity* (ib., 1904); E. T. Devine, *Principles of Relief* (ib., 1904); E. W. Capen, *Historical Development of the Poor Laws of Connecticut* (ib., 1905); Muensterberg, *Amerikanisches Armenwesen* (Leipzig,

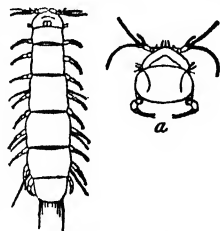
1906); E. T. Devine, *Misery and its Causes* (New York, 1909); State of Massachusetts, *Report of the Commission on Old Age Pensions* (Boston, 1910); R. L. Dugdale, *The Jukes: A Study in Crime, Pauperism, Disease, and Heredity* (4th ed., ib., 1910); S. G. Smith, *Social Pathology* (New York, 1911); Rowntree and Lasker, *Unemployment: A Social Study* (ib., 1911); Heffner, *History of Poor Relief in Pennsylvania, 1682-1913* (Cleona, Pa., 1913); Census of 1890 and special report of Bureau of Census, *Paupers in Almshouses, 1904* (Washington, 1906); also reports of various State conferences of charities.

General: Conrad, *Handwörterbuch der Staatswissenschaften* (Jena, 1909-12), articles under title "Armenwesen." The subjects treated are: Introduction; History of Public Poor Relief; Poor Laws of Various Countries; The Care of the Poor; Poor Rates; Statistics of Pauperism. The articles here given form by all means the best and most complete study of the subject for the purposes of the general reader.

PAUR, pour, EMIL (1855-). An Austro-American pianist and conductor, born at Czernowitz. After preliminary instruction under his father he became a student at the Vienna Conservatory and subsequently held many important appointments. In 1876 he was kapellmeister at Cassel and in 1880 principal court kapellmeister and conductor of the Mannheim subscription concerts. He was director at the Leipzig Stadt Theatre in 1891 and two years later was called to Boston as the successor of Nikisch of the Boston Symphony Orchestra. He became conductor of the New York Philharmonic Society concerts in 1898 and the following year succeeded Dvořák in the directorship of the National Conservatory. He conducted at the Metropolitan Opera House, New York (1899-1900). In 1903 he conducted at the Royal Opera in Madrid and from 1904 to 1910 was conductor of the Pittsburgh Symphony Orchestra. When Muck (q.v.) went to Boston in 1912 Paur succeeded him as conductor at the Royal Opera in Berlin. He is the composer of a Symphony in A, *In der Natur*.

PAUROP'ODA (Neo-Lat. nom. pl., from Gk. *παῦρος*, *pauros*, little, small + *πούς*, *pous*, foot). A small group of arthropods allied to the thousand legs (Diplopoda). The few species known are minute, the body behind the head composed of 12 segments, which on the back are represented by six plates. They differ from the Diplopoda in having but a single pair of legs to a segment. The order is represented by *Pauropus lubbockii* in the eastern United States and Chile and by a flattened broad form, *Eurypauropus*, found in the United States and Europe. The species are cosmopolitan and represent an ancient type. Consult Kenyon, "Morphology and Classification of the Pauropoda," in *Tufts College Studies*, No. 4 (Somerville, Mass., 1895).

PAUSA'NIAS (Lat., from Gk. *Παυσανίας*) (?-c.469 B.C.). A son of Cleombrotus and Regent of Sparta as guardian of his cousin, Plistarchus, the son of Leonidas. He commanded the Greeks



PAUROPUS LUBBOCKII.
a, front view of head.

in the battle of Plataea (479 B.C.), in which the Persian army under Mardonius was overwhelmed, and 11 days later, marching to Thebes, demanded of that city the surrender of all who had been traitors to the Greek cause. After a siege of 20 days the Thebans yielded. In 477 B.C. there was put under his command a fleet of the confederate Greeks, wherewith to drive the Persians from the islands and coast towns, and with this he took Cyprus and Byzantium. Elated by these victories and puffed up with pride and ambition, he entered into secret negotiations with the Persians, with the purpose of becoming ruler, subject to the Persian monarch, of the whole of Greece. Meanwhile he treated the allies as though he were their lord and sovereign, adopted Persian dress and manners, protected his person with a bodyguard of Persians and Egyptians, and introduced into his household habits of Oriental luxury. Being recalled by the authorities at Sparta, he was acquitted on the main charge of treason, and again returned to the Hellespont to renew his intrigues with the Persians. He was a second time summoned home and arraigned, but was a second time acquitted. He now, while still continuing his negotiations with Xerxes, began also to intrigue with the Helots, promising them freedom and citizenship if they would rise and overthrow the government. At last he was betrayed by one Argilius, whom he had commissioned to carry a letter to the Persians. Argilius, noticing that no one of those previously sent on a similar errand had ever returned, opened the letter, found directions therein for his own death, and laid the matter before the ephors. Pausanias, finding his plot discovered and himself entrapped, took refuge in the temple of Athene Chalciæcus. Hereupon the people blocked up the entrance with a pile of stones, the first stone being laid by his aged mother, and left him to die of hunger and exposure. This was about 469 B.C. Consult: Herodotus, ix, 10-88; Cornelius Nepos, *Pausanias*; and the histories of Greece by Grote, Curtius, Abbott, Holm, Beloch, and Meyer.

PAUSANIAS. A Greek traveler and geographer, author of *Ἑλλάδος Περιήγησις, Hellados Periêgêsis* (Guidebook to Greece). Of his early life little is known. He was probably a native of Lydia in Asia Minor, and was certainly at work on his book as late as 175 A.D., though the earlier part seems to have been published some years before. His work, in 10 books, is a detailed description of what seemed to him the most important places and monuments in Greece, arranged by districts and in much of the work described in a most systematic fashion. His interest is largely religious, and so, though other buildings are mentioned, the chief space is devoted to temples and lesser shrines, often with interesting and curious details concerning local traditions and ceremonies. In general he pays little attention to recent art or buildings, reserving his admiration for the great works of the fifth and fourth centuries B.C. The dry details of topography are relieved by historical digressions, often of no great accuracy, anecdotes, and legends. The style is dry and often obscure and the manuscripts are not infrequently defective. In spite of its undoubted weaknesses the book is an invaluable source not merely for the topography and monuments, but for the local cults, and its value increases with new exploration. For his history Pausanias

of course depended on his predecessors, and for traditions and descriptions he seems to have used earlier material; but there is no good reason to doubt that his work represents personal travel and investigation, and its general accuracy is confirmed by recent discoveries. There are a number of early editions of Pausanias, but the best complete texts are those edited by J. H. C. Schubert (Leipzig, 1853-54; often reprinted), and an edition with critical and explanatory notes by Hitzig and Blümner (3 vols., Leipzig, 1896-1910); the fullest commentary is by J. G. Frazer, *Pausanias' Description of Greece*, translated with commentary (6 vols., London, 1898; new ed., 1913); valuable for Athens are Jahn and Michaelis, *Arx Athenarum a Pausania Descripta* (3d ed., Bonn, 1901); Harrison and Verrall, *Mythology and Monuments of Ancient Athens* (London, 1890); Mitchell Carroll, *The Attica of Pausanias* (Boston, 1907). For the criticism of Pausanias, consult: Kalkmann, *Pausanias der Perieget* (Berlin, 1886); Wilhelm Gurlitt, *Pausanias* (Graz, 1890); Rudolf Heberdey, *Die Reisen des Pausanias in Griechenland* (Vienna, 1894); J. G. Frazer, *Pausanias and Other Greek Sketches* (London, 1900); id., the introduction to his commentary and translation (see above); H. Ebeling, "Pausanias as an Historian," in the *Classical Weekly*, vol. vii (New York, 1914).

PAUSIAS, παῦσι-ας (Lat., from Gk. Πάσιος). A Greek painter of the first half of the fourth century B.C., a pupil of Pamphilus and a contemporary, if not a fellow student, of Apelles. He was a great decorative artist, especially in encaustic, and was reputed the first to paint ceilings, setting within garlands and wreaths small genre pictures, especially of children. His famous painting of Glycera, a flower girl of his native city, Sicyon, and probably his mistress, showing her with a garland in her hair, or a copy, was sold to Lucullus for two talents. His skill in foreshortening made his work prized in Rome, where a black bull at the altar, head to the front, and with such clever perspective that the length was easily guessed, was one of the great pictures in the portico of Pompey's temple. See Pliny, *Historia Naturalis*, xxxv, 127.

PAUW, pou, CORNELIS VAN (1739-99). A Dutch author. He was born at Amsterdam and educated at Göttingen. He joined the Order of Franciscans and became canon of Xanten in the Duchy of Cleves; was afterward appointed reader to Frederick II of Prussia. He declined the place of an academician of Berlin and a bishopric at Breslau. He published *Recherches philosophiques sur les Américains* (1768-70; enlarged editions, 1770, 1774); *Recherches philosophiques sur les Egyptiens et les Chinois* (1774); *Recherches philosophiques sur les Grecs* (1778). These works were translated into English (Rochdale, 1806; London, 1795, 1793 respectively). They contain curious information, but many unproved assertions made in a dogmatic spirit. A complete edition of his works appeared in Paris in 1795.

PAUWELS, pou'êls, FERDINAND (1830-1904). A Belgian historical painter. He was born at Eeckeren, near Antwerp, April 13, 1830, and studied at the Academy of Antwerp, principally under Wappers. He gained the Roman prize in 1852 and remained four years at Rome. Upon his return to Antwerp he achieved fame with his "Widow of Jacob van Artevelde"

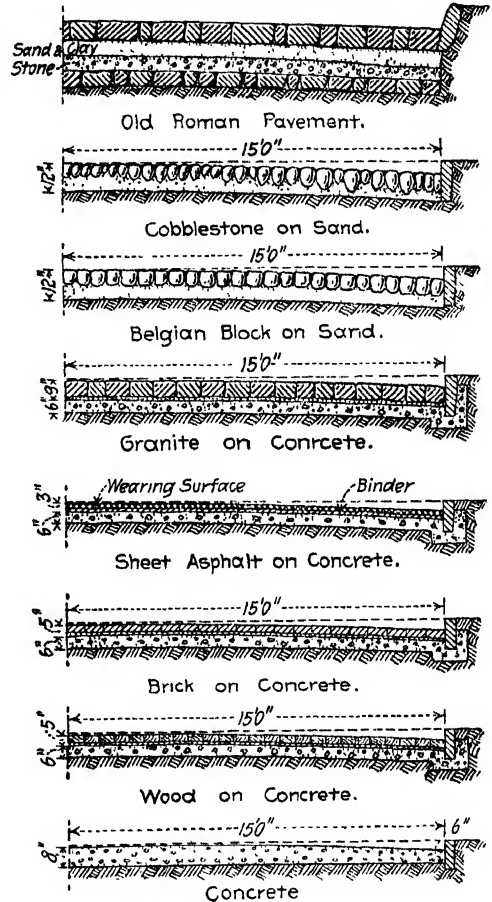
(1857, Brussels Museum) and "Banished by Alva" (1861). From 1862 to 1872 he was professor in the Art School at Weimar and painted, besides other pictures, the "Reception by Louis XIV of a Deputation from the Doge of Genoa" (1864, Maximilianeum, Munich) and several mural paintings in the Wartburg illustrating the history of Luther. He returned to Antwerp in 1872 and finished the historical cycle of wall paintings by Groux in the Cloth Hall of Ypres. In 1876 he became professor at the Academy of Dresden. His later works include "Count Philip of Alsace Visiting a Hospital at Ypres" (1877, Dresden Gallery) and "Admonition" (Leipzig Museum). The paintings of Pauwels are intelligently composed, with great archaeological exactness, his figures are well characterized and the color is good, but his work lacks depth and feeling.

PAVANE, pāv'an or pāv'an' (It. *pavana*, probably a variant of *pavone*, *paonc*, peacock; so called from the stately character of the dance; commonly derived, however, from It. *Padvana*, *Padovana*, Paduan, from *Padova*, Padua, as being supposed to be the place where the dance originated). An ancient Italian dance which spread from that country into Spain, thence to France, and eventually to England and Scotland. It was most popular during the sixteenth century, and was especially so in Spain and at the court of James V of Scotland. It was a solemn, stately dance, generally accompanied by a song. The music was always written in even time and the steps were simple and slow, the performers alternately advancing and retreating. There were various modifications of the pavane, the most important being the Spanish, which introduced a number of elaborate figures. During the seventeenth century the pavane played a most important rôle in the dance suites of the German composers.

PAVEMENT (OF. *pavement*, *paviment*, Fr. *pavement*, from Lat. *pavimentum*, pavement, beaten floor, from *pavire*, to beat, Gk. *πάειν*, *paiein*, to beat, Skt. *pavi*, thunderbolt). This term, in its broader sense, includes any firm, hard covering for areas subjected to the wear and tear of human feet or of hoofs and wheels, designed to keep the feet or wheels from the ground or earth and to present a more or less dry, durable, and smooth surface. Under this definition would be included the paved floors of cathedrals and other public buildings often of an ornamental character (see **TILES**), as well as the surfaces of courtyards, walks, streets, and highways on which stones or other durable materials are placed. In the modern and more restricted sense pavements are generally limited to the wearing surface of that portion of improved streets lying between the curbs, thus excluding the sidewalks.

The early history of pavements is involved in obscurity. Strabo says Babylon was paved 2000 years B.C., and Livy relates that about 170 B.C. Rome was paved from the ox market to the temple of Venus. Before the Christian era the Romans had learned to construct solid and durable pavements, composed of several layers of stone, mortar, and cement, the upper surface being quite smooth. Portions of these early pavements are said to have been in use within comparatively recent times. Excavations at Pompeii reveal some of the old Roman streets just as they appeared when the city was destroyed 79 A.D. The stone blocks were large,

many-sided, with their vertical edges carefully fitted, the whole resting on a solid foundation composed of several layers. The material used was lava. It is said that the streets of Cordova in Spain were both paved and lighted as early as 950 A.D., under the caliph Abd-er-rahman III, but most mediæval cities were unpaved until about the twelfth century, and nearly all pave-



TYPICAL STREET PAVEMENTS

ments from that time on until well into the nineteenth century were of rude construction, cobblestone being a common material.

Paris first had pavements, it is believed, about 1184, when its population was estimated at 200,000. In 1698 the pavements of Paris were described as being "of square stones of about 8 or 10 inches thick; that is, as deep in the ground as they are broad on top." Tillson says that the English Parliament ordered the London Strand paved in the fourteenth century, but adds: "It is said that the first regular pavements were laid in 1533, when the city had a population of 150,000. Holborn had some pavements in 1417. Square granite blocks were introduced by acts of Parliament for Westminster in 1761 and for London generally in 1766." In the United States cobblestone pavements were laid as early as 1650 in both Boston and New York.

During the second quarter of the nineteenth century the cities of both Europe and America began to look about for better pavements and to

experiment with stone and wood blocks and (in Europe) with asphalt. From 1850 to 1875 bricks were tried in America. During the period from 1875 to 1900, and more particularly from 1890 to 1900, the theory and practice of street paving were put on a more satisfactory basis than ever before, and thousands of miles of new pavements were laid. Since 1900 the development has continued, and the mileage has been greatly increased.

Asphalt was first used in Paris in 1838, but not on a large scale until 1854. It was introduced in London in 1869. In both these cities the material was rock asphalt. What is believed to have been the first asphalt pavement in the United States was laid in Newark, N. J., in 1870 by E. J. de Smedt. In 1871 some asphalt was laid in New York and a little later in Philadelphia. The material in each of these three cases was Trinidad asphalt. In 1876-77 both rock and Trinidad asphalt were laid in Washington. The good results obtained in that city led to the rapid introduction of asphalt there and elsewhere, but comparatively little rock asphalt has been laid in America.

Brick was used to pave roads in Holland as early as the seventeenth century and has been used extensively for both roads and city streets since. Brick pavements are said to have been used in Japan for more than 100 years. The first brick pavement on a roadway in the United States was laid at Charleston, W. Va., in 1870, and in 1873 the city adopted the system for certain streets. This example was followed by many Central Western cities, but Philadelphia was the first large city to make use of this material, laying some brick roadway pavement in 1887. Since 1900 the increase in the use of brick for pavements both on city streets and country roads has been remarkable, owing very largely to the efforts of the National Association of Paving Brick Manufacturers to better their output and to standardize the laying of brick pavements by the best methods.

Wood blocks were laid in New York as early as 1835-36, and in 1839 wood pavements were already in use in both Philadelphia and Boston, being mentioned in a report made to the Franklin Institute (Philadelphia) by a committee on paving materials. London laid its first wooden pavement in 1839, Glasgow in 1841, Paris much later.

Stone blocks of the modern type, of 3 × 9 inches, granite, with mortar joints, were laid on Blackfriars' Bridge, London, in 1840. Glasgow laid granite blocks in 1841. A concrete foundation was used in London, the first in that city, in 1872, and tar and gravel joints were employed in both London and Liverpool about the same time, although used in Manchester, England, prior to 1869. Prior to 1849 scarcely any pavements but cobblestone were used in New York. About 1850 Belgian blocks were introduced. Granite blocks similar to those now used were introduced in New York about 1876, succeeding some much larger blocks, known as the Guidet patent. Concrete foundations for stone pavements were not used regularly in New York until 1888. Large stone blocks were used in St. Louis as early as 1818, being from 3 to 12 inches thick, 6 to 14 inches long, and 6 to 10 inches deep, set on 6 inches of sand. In 1842 stone blocks of about the present size and shape were used in St. Louis. There has been a recent tendency to reduce the size of stone pav-

ing blocks. Good practice now calls for a block 6 to 10 inches long, 3½ to 4½ inches wide and 4¾ to 5¼ inches deep, which is much nearer the size of a paving brick than the old blocks. Since 1912 there has been an attempt to introduce in the United States the 3-inch and 4-inch stone cube pavement, which has been used in Germany for a number of years under the name of Kleinpflaster pavement. These small blocks are generally made by a mechanical cutting tool and are known by the trade name of Durax blocks. Several experimental pavements of this type have been laid in American cities.

Concrete was probably first used for a pavement surface in Inverness, Scotland, about 1865. The first concrete pavement in America was laid in Bellefontaine, Ohio, in 1884. Since 1900 concrete has been very extensively used for street pavements in the cities of the Central West, and since 1910 many miles of country roads have been paved with concrete. The ordinary thickness of these pavements is 6 to 8 inches at the centre and 5 to 6 inches at the edges.

In America the pavements now being laid are principally asphalt, brick, stone, wood, and concrete.

Rock asphalt is used to some extent in London, Paris, and other European cities, and stone blocks are common. Brick does not appear to have gained the footing in Europe that it has in America. There is still another sort of improved street surface which has been very common on roads and on streets of light traffic throughout the United States, Canada, Great Britain, and at least the western part of continental Europe, viz., the compacted broken stone, known as macadam or telford.

Formerly these pavements were what is known as water bound, i.e., the fragments of stone bonded together by a natural cement of dust and moisture; but such pavements have been unable to withstand the traffic of motor vehicles and many of them have either been given a bituminous surface by the application of asphalt or tar oils or have been entirely discarded as street pavements. A bituminous macadam pavement is one of compact broken stone in which the binding material is a bituminous cement of tar or asphalt. The binder may be applied during the rolling process by some form of sprinkling or spraying apparatus, which is known as the penetration method, or by mixing the mineral aggregates and bitumen together, as in sheet asphalt pavements, and then rolling, which is known as the mixing method. A bituminous macadam pavement constructed by the mixing method is generally termed a bituminous concrete pavement and in all essentials is merely a less expensive substitute for sheet asphalt. See ROADS.

Foundations are to pavements what floors are to carpets, or, conversely, the visible parts of pavements are but the wearing surfaces of streets. Failure to recognize the importance of good foundations has been the bane of most American and many foreign pavements. If the foundation yields, through deficient drainage or bad material and workmanship, the destruction of the pavement follows. In some soils natural drainage is ample. Where it is not, either a drain in the centre or at one or both sides of the street is required to remove the subsoil water. These drains may be of stone, tile, or sewer pipe, according to the relative cheapness of

the several materials in the locality concerned and the character of the drainage work. Drainage provided, and the surface on which the pavement is to be laid shaped and compacted, the foundation is next put in place. For serviceability nothing surpasses concrete as a foundation. The chief argument against it is its cost, which may range from 50 cents per square yard upward. The thickness of the concrete should rarely be less than 6 inches and may run as high as 10 inches. Sometimes broken stone alone is used for foundation, and again stone, brick, or wood is laid directly on sand.

If the traffic is not heavy, sand, gravel, or broken stone may sometimes be used with a fair degree of success, particularly if the earth beneath is well compacted and thoroughly drained. Asphalt should always have a concrete foundation, except where laid on top of an existing pavement of some other material which will form a good bed. The finished surface of the foundation should be brought to such a curve or crown, crosswise of the street, as will shed the rainfall to the gutters. Crowns vary from $\frac{1}{4}$ to $\frac{3}{4}$ inch to each foot of width, according chiefly to the kind of pavement, the smooth types such as asphalt requiring the least. The best practice is to use as small a crown as is consistent with good drainage. The crown should increase with the width of the street, but not necessarily in direct proportion.

Cushion coats, composed of 1 to 2 inches of sand, are generally placed on concrete foundations for all materials save asphalt, and also on brick laid flatwise for foundations. They allow the separate blocks or bricks to be brought to a firm bed by ramming or rolling. They also provide for uneven depths in blocks or bricks, thus aiding in bringing the finished pavement to a true surface.

Fillers are employed to close the joints between blocks and bricks. They are often of some waterproof cement, thus rendering the pavement impervious as well as binding it together. Where bituminous in character, like asphalt, coal tar, or the two combined, they also yield somewhat to contraction and expansion, without permanent rupture, as is the case with the Portland cement and other burnt stone fillers. *Portland cement filler* is a grout composed of one part cement and one or perhaps two parts fine sand, mixed with sufficient water to cause it to run easily, thus filling the interstices. *Bituminous* cements are many and variable, but may be classed as coal-tar pitch and asphalt. Residuuum oil (obtained in the refining of petroleum) is generally, but not always, used with asphalt cements. (See ASPHALT.) Coal-tar pitch alone becomes brittle and cracks or breaks in winter, while in summer it becomes hot and flows. It is designated commercially by the degree of hardness to which it has been distilled. New York City practice is to use a bituminous filler almost entirely for granite-block and wood-block pavements. It is generally optional whether this filler be of asphalt or of tar. While the common practice is first to sweep sand and pebbles into the joints and then pour in the hot bituminous filler, the most recent method is to mix the sand and pebbles with the heated bitumen to form a mastic. With the close ($\frac{3}{8}$ -inch) joints required in New York City granite-block pavements the latter method has been the more satisfactory. All the bituminous cements are poured hot

Sand alone is also used as a filler, but not where imperviousness is desired.

Ramming is employed on stone, and rolling on wood and brick, pavements to bring the blocks or bricks to a firm bed and even surface. Rolling with steam or other rollers is a necessity with sheet-asphalt and bituminous pavements and is sometimes done with concrete.

Choice of Paving Materials depends on a variety of factors, such as serviceability, durability, cost of construction, repairs, and maintenance, ease of cleaning, noiselessness, and other sanitary or related qualities. Under serviceability the main factors are a minimum resistance to traction and a good foothold for horses, or absence of slipperiness. Asphalt fulfills the first of these conditions most admirably, and probably brick comes next. Asphalt is slippery, both in wet weather and on heavy grades. Brick is less slippery. Newly laid wood gives a smooth pavement, but it is liable to wear unevenly and to be slippery in wet weather. For durability or long-wearing powers the best stone blocks cannot be excelled, and under heavy traffic they are very serviceable, although offering more resistance to traction than several other materials. In first cost, asphalt, wood, and the best stone blocks rank high, but this is largely offset by their durability and low cost of repairs. Brick pavements are very cheap in some localities, and if placed on good foundations they are sufficiently durable. The growing scarcity of lumber suitable for the purpose and the cost of properly treating the blocks render wood expensive, but it is growing in favor. For ease of cleaning nothing can surpass asphalt, and it gives rise to less noise than either stone blocks or brick. Brick is also easily cleaned and far quieter than stone blocks. The latter are not only noisy, but also hard to clean, and unpleasant to ride over, on account of their roughness. However, there has recently been a great improvement in the methods of making stone-block, or particularly granite-block, pavements. By the selection of proper materials, more accurately shaped blocks, permitting their being laid with close joints, and careful attention to other details of construction, granite-block pavements are now made which are almost as smooth and but little more noisy than brick pavements. The smoothness of asphalt and brick, and the quickness with which their surfaces dry after a rain or a sprinkling, make them great dust spreaders, but the ease and thoroughness with which they may be cleaned render an avoidance of this nuisance comparatively easy. The large joints of the old stone-block pavements collect and retain dirt, but, as it is next to impossible to clean all of it from between the stones, it dries and spreads when subjected to the sun and wind.

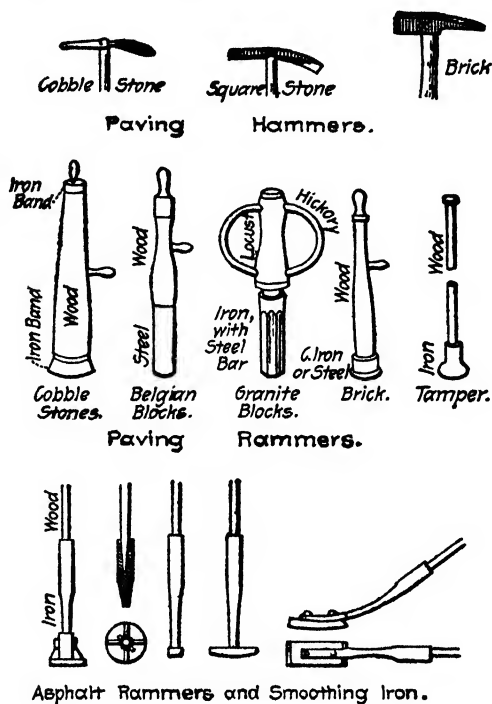
Cost of pavements varies widely with local conditions, particularly the depth and character of the foundations, the kind and quality of the wearing surfaces, the inclusion (or absence) in the contract of maintenance guarantees, and the freight rates. The variations are even greater when the cost of grading is included. For comparative purposes the cost of grading, draining, and curbing should be omitted; and the maintenance guarantees, if any, should be described. In fact, without full details relating to the various factors involved, comparative figures of cost are often worse than useless. The *life* of pavements, or the period for which they may be

used without renewing the wearing surface, is given by Tillson as follows: granite blocks, 20 to 25 years; Belgian blocks, 20 years; asphalt and cobble, each 18 years; brick, 15 years; wood, 10 to 15 years; bituminous concrete, 8 to 10 years; macadam, 8 years.

Tools for paving work include hammers, rammers, tamping irons, crowbars, sand and gravel screens, and brooms, besides special asphalt tools and machinery and a variety of tools and machines common to road and other work, such as rollers and concrete and gravel mixers. The graders, scrapers, and other apparatus used in preparing the earth subgrade, and also the rollers used to compact the natural earth and various classes of paving material, will be described under ROAD and STREET MACHINERY. Concrete mixers are described under CONCRETE. Pavers' hammers have a head at one end for pounding the blocks, and a sort of combination chisel and scoop at the other, to facilitate the preparation of the sand cushion and to pry out or loosen single blocks in the setting. Different-shaped hammers are used for cobble than for squared stones, and still different ones for brick. Rammers also vary in shape and weight, according to the character of the blocks for which they are designed. For stone the weights are 40 to 45 pounds; for brick, 25 to 30 pounds; for earth, about 20 pounds. Several shapes of tamping irons are used for street asphalt, to facilitate work along curbstones and to meet other special needs. These rammers have cast-iron heads and wooden handles. The smoothing irons are of the same materials, but are slightly convex to the pavement and are mounted on handles curved at the lower end. Both the tamping and smoothing irons are heated in fire boxes mounted on wheels. Screens for sand and gravel are of the familiar type used by masons, consisting of wire meshes of the desired size mounted in wooden frames. The brooms used for brushing sand and gravel into joints are short and stiff, of rattan, wood fibres, or wire. Various kinds of special apparatus are used in repairing asphalt pavements, the most important of which is a surface heater, a self-propelling machine which is provided with a furnace for turning a blast of very hot air against the pavement surface. An inch or 1½ inches of the old surface, softened by the heat, is then removed and replaced by a new mixture and rolled.

Asphalt Pavements are divided into sheet and block. Sheet asphalt consists of a binder and a wearing surface, the binder serving to unite the foundation and the wearing surface. The binder is composed of small pieces of broken stone, united with asphaltic cement. The mixture is spread on the foundation in a layer sufficiently deep to give the requisite thickness after having been rolled. A final thickness of 1 inch is considered ample by some, but 1½ and even 2 inches is not uncommon. The wearing surface is composed of sand, carbonate of lime (powdered limestone), or Portland cement, and asphaltic cement, mixed hot in varying proportions. The object is to use enough powdered limestone or cement to fill the voids in the sand as completely as possible and enough asphaltic cement to bind the whole together. It is also desired to make the pavement impervious to water. The consensus of opinion is that the wearing surface should contain 9 to 12 per cent of bitumen and have a final thickness of 1½ or 2 inches. It should be spread on the binder while

the mixture is hot, say at a temperature of 250° F. The spreading is effected by men with rakes, who are followed by other men with hand rollers or very small steam rollers. Next hydraulic cement is scattered over the surface. After this comes first a 5-ton and then a 10-ton steam



TOOLS USED IN STREET PAVING.

roller. Thus three rollers are used in succession, the lighter ones first, in order to prevent distortion of the asphalt while soft. Generally the asphalt is laid clear up to each curb, special care being taken with the gutters, but sometimes brick or stone is used in place of asphalt in the gutters. The need of special precautions here is the danger from the water that gravitates to the gutters. Cracks are liable to occur in sheet asphalt subjected to wide variations in temperature. Most of the asphalt pavements laid in America have been composed of Trinidad sheet asphalt, but in recent years both the Bermudez and Alcatraz products have been employed. Since the development of the Californian, Mexican, and other Western oil deposits, the petroleum products from which have asphalt bases, there has been much keener competition in the asphalt industry, and the by-products of these oil refineries have become very large factors in asphalt paving. The best practice is to use any asphalt which fulfills certain chemical and physical tests, irrespective of whether it is a so-called natural asphalt such as Trinidad or a residual from the refinement of petroleum. See ASPHALT.

Asphalt Plants, used to prepare the material for laying sheet-asphalt pavements, include melting kettles, sand heaters, mixers, and various accessories. The asphalt arrives at the plant in barrels or steel drums. These are cut away, and the asphalt and the residuum oil or other flux are heated and thoroughly mixed in

the kettles. The mixing may be effected by revolving paddles, or by pumping in air at the bottom of the kettles. The sand is dried and heated in jacketed revolving cylinders, fitted with angle bars to keep the sand well agitated. The drum is set at a slight angle, so that the sand will find its way out. It falls into elevators, which take it to a bin on or above the mixing platform. In case pulverized limestone cannot be had in the vicinity of the plant a limestone-grinding mill is provided, or Portland cement may be used instead. All the ingredients being ready, the asphaltic cement, sand, and limestone are admitted to the mixer. This is an iron box, with a capacity of 8 to 16 cubic feet. Two parallel revolving shafts, each fitted with steel blades and revolving in opposite directions, are placed in the bottom of the box and effect a thorough mixing of the several materials. When mixed, the finished paving material is dumped from the mixer into a cart or wagon and hauled to the street.

Rock Asphalt Pavements are composed of crushed limestone or sandstone, naturally impregnated with bitumen. If the natural product does not have the desired proportion of bituminous matter, this is rectified by mixing a richer or poorer rock with the first. The mixture is powdered, sifted, then kept heated for two hours at 300° F. to 325° F., after which it is carted to and spread upon the street. After a light rolling, followed by hand tamping, the surface is covered lightly with hydraulic cement and rolled with a steam roller. The European rock-asphalt pavements are all made from bituminous limestone, but in America both sandstone and limestone bituminous rock are used, sometimes mixed together. Little trouble from cracking arises with the rock asphalts; they are generally considered more durable and more slippery than the artificial asphalt mixtures. In Paris some of the asphalt pavements are prepared by adding enough bitumen to the rock asphalt to bring the total bitumen up to 15 or 18 per cent. The mixture is heated to such a consistency that it can be spread or floated into a layer about 1½ inches deep. It is not rolled. Other asphalt pavements in Paris are compressed.

Block Asphalt is formed by mixing crushed trap rock and asphaltic cement at a temperature of some 300° F., and molding the mixture in machines under a pressure of 120 tons to each block. The blocks measure 5 × 12 inches on the street surface and are either 2 or 3 inches deep. They are laid much like brick, except that no joint filler is required. It is claimed for asphalt blocks that they are made of a uniform composition and at a uniform temperature, always under cover, thus yielding a product of constant quality; also that they are available for use in small places where the erection of a plant for the preparation of sheet asphalt would be out of the question.

Brick Pavements are composed of tough, hard, nonabsorbent brick, designed to withstand the hammer-like blows and abrasive action of hoofs and wheels and to resist the action of water and frost. In size, shape, and general appearance they resemble ordinary building brick, but they are made and burned with more care. (See BRICK.) Where feasible, brick should have a concrete foundation. On the latter a 1-inch or a 2-inch cushion of sand is laid. The bricks are set edgewise on the sand, their

lengths running across the street and joints being broken. At street intersections each quarter of the area is laid diagonally, so that the length of the brick will be at right angles to the direction of the traffic when the latter is turning corners. The bricks are rolled to bed them firmly. Such bricks as sink below the surface are replaced with deeper ones. Although the bricks are set in as close contact with each other as is feasible, open spaces remain. Nearly all the fillers described above have been used for brick pavements. Sand is not suitable, as it quickly washes out. There has been great difference of opinion as to the relative merits of Portland-cement grout and the bituminous fillers, but it is now generally conceded that the grout is the better. Both kinds of filler are poured over the surface of the pavement and swept into the joints with brooms. After this has been done the pavement is covered with a thin layer of sand. Expansion joints are sometimes provided, both lengthwise and crosswise the streets, the former at each curb line and the latter at intervals of 25 to 50 feet. They are made by filling a narrow space or spaces between bricks with some form of bituminous cement. The National Association of Paving Brick Manufacturers, which has done the most to promote brick pavements, recommends only cement-grout filler and strongly opposes crosswise expansion joints as detrimental to the pavement.

Wood Pavements are composed of blocks of wood, laid with the grain or fibre perpendicular to the foundation. The rectangular blocks are most commonly 3 × 9 inches × 3½ to 6 inches deep. The round blocks are 4 to 8 inches in diameter and about 6 inches deep. Blocks of hexagonal and other shapes have been tried, but experience has shown that the special forms have no advantage commensurate with their cost. The round and the rectangular blocks are sawed to the desired length from logs or from plank, gang saws sometimes being used. The bark, and in some cases the sapwood, is cut from the round blocks by machinery. The blocks should be treated with creosote or some other wood preservative. Unless this is done, it is questionable whether wood should be used for paving purposes. The round blocks have much space between them to be filled; the rectangular blocks are sometimes laid close together and sometimes with spaces. Various fillers, in semiliquid form, composed of sand and some cementing material (Portland cement, tar, or asphalt), are used to close these spaces. Expansion joints are often but not always inserted at the curb. These are strips of sand or some other material that will compress when the wood blocks expand in wet weather and will expand when the blocks contract in dry weather. Until about 1900 round cedar blocks were more freely used in America than any other wood. In Europe pine, fir, and more recently Australian hard woods, known as karri and jarrah, have been employed. In Chicago round cedar blocks were laid as follows: About 2 inches of sand was spread over the surface to be paved. On this a flooring of 2-inch hemlock plank was laid, supported at the centre and each end by 1 × 8-inch boards, laid flatwise in the sand. The blocks were set on end on the plank. The spaces between the blocks were at least ¾ of an inch, but not more than 1½ inches in size. The joints were filled with clean, screened dry gravel,

thoroughly rammed in, after which the whole pavement was covered with hot coal-tar pitch, and this in turn was covered with $\frac{3}{4}$ of an inch of roofing gravel. At Indianapolis rectangular red cedar blocks were laid in 1894 and 1896, and heartwood Southern yellow pine later on. The first blocks were not treated, but the later ones were creosoted. The blocks were laid on a concrete foundation, with a 1-inch sand cushion, and latterly with expansion joints at the curb. The joints were partially filled with fine sand, after which the pavement was rolled, then covered with hot paving pitch and fine gravel. The cedar blocks were 5 inches, and the pine blocks 4 inches deep. Since 1900 creosoted wood blocks and also wood blocks treated with creosote and resin have been gaining in favor in the United States. In 1906 the growing scarcity of yellow pine led to the use of some of the Southern gumwoods, with promise of satisfaction. The best practice, however, is still to require creosoted yellow pine. Some of the London hardwood pavements have been of blocks $3 \times 9 \times 5$ inches deep, laid close. At the gutters three courses were laid parallel to the curbs, the blocks having been dipped in a boiling mixture of four parts of tar and one part of pitch, and there being a 1-inch sand-filled expansion joint at each curb. The main part of the street was covered with blocks laid crosswise. The filling is effected with boiling tar and pitch, first covering the entire surface, then worked into the joints; after which cement grout is floated over the pavement, then sand thrown over all. Softwood pavements of the same period in London were not less than 6 inches deep, creosoted, and had their joints filled with a grout of blue lias lime and sand.

Stone-Block Pavements are most commonly of granite, some of the harder and tougher sandstones, and trap rock, the latter being the least satisfactory of the three. The lengths and depths are quite variable in different cities, but in the best work the widths range from 3 to 4 or $4\frac{1}{2}$ inches, with a tendency to $3\frac{1}{2}$ inches in American cities. The governing condition of width is the foothold for horses. Depths should be at least one and one-half times the narrow and medium widths, to give a firm setting that will prevent rocking on the base. In American cities common dimensions are as follows: widths, $3\frac{1}{2}$ to $4\frac{1}{2}$ inches; lengths, 6 to 12 inches; depths, 4 to 8 inches. In a number of European cities there is a tendency to square or nearly square blocks, approximating 6 inches on a side, with depths of 6 to 8 inches. Square blocks (or Belgian; see below) are also used in the United States, but not frequently of granite, as is the case abroad. The blocks should be as nearly rectangular and flat as is possible on the tops, sides, and ends. The blocks are generally laid crosswise of the street and diagonally at intersections. A sand cushion is used when the blocks are laid on concrete, as they should be almost invariably, since stone blocks are generally used where the traffic is heavy. The filler most commonly employed for the joints is first gravel, then hot paving cement. Medina sandstone is sometimes laid as close as possible and filled with asphaltic cement or Portland cement. *Belgian blocks*, so named from their use in Belgium, have tops 5 or 6 inches square, bottoms somewhat less, but generally not more than 1 inch smaller each way, and depths of 7 to 8 inches. These blocks have

been extensively used near New York, and trap rock, being plentiful and cheap in that vicinity, has been employed for the purpose. The trap does not break to a true surface readily and is not easily worked, so that it is difficult to get good surfaces with Belgian block of this material. It is very durable, but wears smooth and slippery. Belgian blocks are almost if not quite always laid on a sand or earth base, since one of the objects in their selection is cheapness; their joints are filled with sand. Trap-rock blocks are also got out and laid in oblong form, much like granite and sandstone in general outline, but with far less regular surfaces. Limestone has been used for block pavements, but to a small extent, as it is too soft to be durable.

All blocks should be laid diagonally at street intersections, as is done with brick. The securing and dressing of stone blocks do not differ materially from the quarrying and working of other dimension stone. *Crosswalks* are laid at street intersections. They are composed of two parallel rows of bluestone, granite, or sandstone, according to the locality and the kind of pavement, with a row of blocks between. The cross stones are $1\frac{1}{2}$ to 2 feet wide, 4 to 6 feet long, and 6 to 8 inches thick. In the best modern work they are laid with a keystone at the centre of the street and with diagonal joints each way, at right angles to the direction of the traffic in turning corners.

Cobblestones are seldom used now. Their only merit is low first cost. They are laid with best results on a base of 6 inches of loamy sand, which gives a firm bedding and tends to hold them tightly in place. They are set on end. The stones should be not less than 4 inches nor more than 8 inches in diameter at the head, not under 5 inches nor over 10 inches deep, and only rounded stones should be used.

Marked changes in paving practice since 1900 have been the increasing use of improved granite blocks and of treated rectangular wood blocks, already mentioned, a growing disfavor for all the rough, coarse-jointed pavements, and the rapid extension of bituminous macadam.

Decorative Pavements. In many of the public squares of Europe the pavement has been treated as a subject of decoration, especially upon certain areas reserved wholly for pedestrians, such as terraces and spaces in front of public buildings. Such decorative pavements are usually of marble of two or more colors; the most celebrated example is that of the square of St. Mark's and the Piazzetta. An example of analogous treatment may be seen in the so-called South Court in front of Columbia University in New York. A common and effective device in Mediterranean countries is the use of small pebbles, white, black, and red, closely set to form a simple mosaic pattern in garden walks and terraces. The term "pavement" is also used to designate the stone or marble floors of churches and halls, which are in the Old World often of great magnificence, all the various forms of mosaic being employed in their decoration. Italy leads in this art, and the floors or pavements of the Pantheon and of the churches of San Clemente and St. Paul-beyond-the-Walls at Rome, of St. Mark's at Venice, and of Siena Cathedral, are especially famous. See FLOOR; MOSAIC.

Maintenance. The greatest enemy to good pavements is the frequent street openings so

common and often so necessary where subways for pipes and wires are not provided. (See **SUNWAYS**.) All street openings to gain access to pipes and wires should be under the control of the city department responsible for the maintenance of the pavements. Great care should be taken in refilling all trenches, the dirt being thoroughly tamped to prevent future settlement. In America maintenance for a period of years is sometimes included in contracts for pavements, but chiefly for asphalt. The periods are of varying lengths, but generally 5 to 10 years. Maintenance guarantees amount, of course, to a higher contract price for what on its face is original construction but is really maintenance as well. When the guarantees expire, a contract for maintenance only is sometimes made with the original or a new contractor. See **ASPHALT**; **BRICK**; **CONCRETE**; **QUARRYING**; **ROAD AND STREET MACHINERY**; **ROAD**; **STREET**.

Bibliography. Maxwell, *Construction of Roads and Streets* (London, 1899); Thomas Aitken, *Road Making and Maintenance* (2d ed., ib., 1907); Clifford Richardson, *Modern Asphalt Pavement* (2d ed., New York, 1908); W. P. Judson, *City Roads and Pavements Suited to Cities of Moderate Size* (4th ed., ib., 1909); H. A. Wheeler, *Vitrified Paving Brick* (2d ed., Indianapolis, 1910); G. W. Tillson, *Street Pavements and Paving Materials* (New York, 1912); Phillips and Byrne, *Treatise on Highway Construction* (new ed., ib., 1912); I. O. Baker, *Treatise on Roads and Pavements* (ib., 1913); F. P. Spalding, *Text-Book on Roads and Pavements* (ib., 1913); Blanchard and Drowne, *Text-Book on Highway Engineering* (1st ed., ib., 1913); and for decorative pavements, R. H. H. Cust, *The Pavement Masters of Siena, 1369-1562* (London, 1901).

PAVEMENT ANT. See **HOUSE ANT.**

PAVET DE COURTEILLE, pá'vá' de kōōr'-tā'y', ABEL (1821-89). A French Orientalist, born in Paris. He was a grandson of De Sacy and studied under him in the Ecole des Langues Orientales. After four years as instructor in the Ecole des Jeunes, in 1855 he became professor of Turkish in the Collège de France and a member of the Institut. It was in Turkish especially that he made important research. He published: *Conseils de Nabi Efendi à son fils Aboul Khair* (text and translation, 1857); *Histoire de la campagne de Mohacz* (text and translation from the Turkish of Kemal Pacha Zadeh, 1859); Maçoudé's *Les prairies d'or* (1861-64), with Barbier de Meynard; Baber's *Mémoires* (1871); *Mirādī Námeh* (1882); *Tezkereh-i-evliyā* (1889); and, most important of all, the *Dictionnaire turco-oriental* (1870).

PAVIA, pá-vē'a. The capital of the Province of Pavia, Italy, situated on the left bank of the Ticino, 2 miles above its confluence with the Po, 18 miles south of Milan, with which it is connected by both river and canal (Map: Italy, B 2). A covered granite bridge (1351-54) of seven marble arches and an iron railway bridge connect the city with the suburb of Ticino, on the right bank of the river. The city is still mostly surrounded by its old walls and has an imposing appearance, but bears a sombre impress of antiquity. The principal streets are the Corso Vittorio Emanuele, Corso Cavour, and Corso Garibaldi. In former times Pavia was called the "city of a hundred towers," but few of these now remain. The oldest church is

San Michele, a fine example of the Lombard-Romanesque style, originally built before 1100, rebuilt after a fire early in the twelfth century in a style internally resembling Sant' Ambrogio at Milan. The present vaults, however, are modern, upon a system differing from the original. Another early Romanesque church is S. Pietro in Ciel d'Oro. The little church of S. Maria di Campanora is attributed to Bramante. The cathedral church of San Martino, a vast Renaissance structure begun in 1488, remained unfinished, but its façade and large dome were completed in 1898. It has a mosaic pavement and some good paintings. In a beautiful chapel attached to it are the ashes of St. Augustine in a magnificent Gothic sarcophagus. The Certosa di Pavia (q.v.), the most splendid monastery in the world, lies 5 miles north of the city. Pavia has a famous university with an imposing and interesting building. (See **PAVIA, UNIVERSITY OF**.) The Palazzo Malaspina contains a museum with a collection of paintings and antiquities and is associated with the lives of Bœthius and Petrarch. The other chief objects of interest are two theatres, a castle built (1360-66) by the Visconti and now converted into barracks, a huge bronze statue of Pope Pius V, a marble statue of Italia, and monuments to Garibaldi and to Volta. The Collegio Borromeo was founded in 1563 and the Collegio Ghislieri in 1569. Both offer scholarships. There are also an episcopal seminary, a lyceum, a technical school, an art and industrial school, and a deaf and dumb institute. Pavia has manufactures of machinery, hats, organs, chemicals, and leather. There are also important marble works. The yearly fair is largely attended, and there is a large trade in wine, rice, oil, silk, and cheese. Pop. (commune), 1881, 34,826; 1901, 35,447; 1911, 39,898; 1914, 40,266.

Pavia, the ancient Ticinum, was founded by the Ligurii. It became a place of considerable importance after the fall of the Roman Empire. It came into the possession of the Goths and Lombards, and the latter made it the capital of their Italian Kingdom, which was conquered by Charles the Great in 774. In 924 the city was taken and destroyed by the Hungarians. It became independent in the twelfth century. After having been weakened by civil wars it was conquered by the Visconti of Milan in 1359. From this time its history is merged in that of the Duchy of Milan and of Lombardy. Here, on Feb. 24, 1525, the forces of Charles V defeated the French and captured Francis I. The city was stormed and pillaged by Napoleon in 1796.

PAVIA. A town of Panay, Philippines, in the Province of Iloilo, 8 miles north-northwest of Iloilo. Pop., 1903, 5700.

PAVIA, UNIVERSITY OF. One of the oldest universities of Europe. It had its inception in a law school that flourished before the twelfth century, and even in the first half of the fourteenth century there still existed traces of the older institution. Galeazzo II Visconti obtained from Charles IV a charter for a Studium Generale in 1361, which conferred upon it all university privileges, and in 1389 it received the same privileges from Pope Boniface IX. In 1398 it was removed to Piacenza. With the death of Galeazzo it declined, and by 1404 it ceased to exist. In 1412 it was restored by Filippo Maria Visconti, and it soon vied with

the leading Italian universities, particularly in Roman law. It had a large attendance of foreigners. In the sixteenth and seventeenth centuries its fame declined, but after its reorganization in 1770 by Maria Theresa and in 1817 by Emperor Francis I it again assumed considerable importance among European universities. In 1913-14 it consisted of the faculties of law, medicine, and surgery, mathematics and natural science, letters and philosophy, and the School of Pharmacy. The attendance was over 1600. The Collegio Ghislieri, founded in 1569, prepares students for the university. The library contains 250,000 volumes, 140,000 pamphlets, and 1100 manuscripts.

PAVIA Y RODRÍGUEZ DE ALBUQUERQUE, pá-vé'á é ró-dré'gáth dá ál'búr-kér'ká, MANUEL (1828-95). A Spanish general. He entered the Royal Artillery College at Segovia (1841), and became lieutenant (1846), captain (1855), and major (1862), then joined the staff of General Prim (1865), and shared in Prim's unsuccessful revolutionary efforts (1866) and in the successful revolution of 1868. Under King Amadeo of Savoy (1871-73) he was in high favor. After the abdication of Amadeo he was the strong leader against the Carlists. When he became master of the situation in 1874, Pavia, being without personal ambition, asked Marshal Serrano to form a government with Sagasta and others, Conservatives and Radicals. Afterward, following the restoration of Alfonso XII, he sat in the Cortes on several occasions and, despite his opposition to Alfonso's marriage with Mercedes de Orléans, was by royal decree appointed life Senator (1880), and was President of the Supreme Council of War at his death.

PAVIE, pá-vé', THÉODORE-MARIE (1811-96). A French Orientalist. He was born at Angers. Early travels in the United States, Central America, and Canada resulted in the publication of his *Voyage aux États-Unis et au Canada* (2 vols., 1828-33); and subsequent travels through Asia, and the study of Asiatic languages, especially Sanskrit and Chinese, formed the foundation of valuable historical and literary contributions to the *Revue des Deux Mondes*, the *Journal Asiatique*, and the *Bulletin of the French Geographical Society*. They also led to appointments as professor of Sanskrit literature in the Collège de France from 1853 to 1857, where he succeeded his teacher Eugène Burnouf, and as professor of Oriental literature in the Catholic university of his native town, where he died May 1, 1896. His principal work is the *San-koué-tchi* (2 vols., 1845-51), a history of China in the thirteenth century. Other works are: *Fragments du Mahābhārata* (1844); *Les trois religions de la Chine* (1845); *Bhōdja-prabandha* (1855), a history of Bhoja, King of Malwa; *La littérature musulmane de l'Inde* (1847); *Krichna et sa doctrine* (1852); and numerous books of travel.

PAVILION (OF. *pavillon*, *paveillon*, Fr. *pavillon*, tent, from Lat. *papilio*, butterfly, tent, pavilion). Primarily, any light open structure providing shelter under a roof or canopy, whether permanent or temporary. The term is also used in the French sense to designate any relatively high and narrow portion of a large building made prominent by greater height or by a higher roof. In the Louvre each slightly projecting central or terminal pavilion is given a distinguishing name. The term is not gen-

erally applied to wings of considerable length, except in the case of the so-called pavilion hospitals.

PAVING. See **PAVEMENT**.

PAVING BRICK. A term properly applied to those brick used especially for paving highways. They are made from clays or shales that will burn to a vitrified body, but the methods of manufacture used are essentially the same as for common brick. Paving brick are usually either $2\frac{1}{2} \times 4 \times 8\frac{1}{2}$ inches, or $3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ inches, the latter being commonly termed blocks. Paving brick are usually tested in the rattler for abrasive resistance, the loss in weight on this test being not over 22 per cent. The absorption should not exceed 4 or 5 per cent by weight. See **BRICK**. Consult Blanchard and Drowne, *Textbook on Highway Engineering* (New York, 1913); also *Proceedings of the American Society for Testing Materials*.

PAVIOTSO. See **SHOSHONEAN STOCK**.

PAVLOGRAD, páv'ló-grát'. A district town in the Government of Ekaterinoslav, Russia, situated on the Vólchia River, a tributary of the Samara, 50 miles east of Ekaterinoslav (Map: Russia, E 5). It has a Gymnasium and carries on a large trade in grain and horses. The town was founded in 1779 and is settled by Zaporogian Cossacks. Pop., 1897, 17,188; 1911, 40,484.

PAVLOV, páv'lóf. A volcano, about 7500 feet high, on the Alaskan Peninsula, in about long. 160° W. It was active in 1903.

PAVLOV, páv'lóf, IVAN PETROVITCH (1849-1916). A Russian physiologist, born in Rjasau, the son of a priest in the Greek church. He studied medicine at St. Petersburg (graduating in 1879; M.D., 1883) and became military surgeon. After a prolonged stay in Germany he was appointed (1890) professor of pharmacology in Tomsk and in the same year professor at the military academy at St. Petersburg. In the latter city he became also director of the physiological institute of the Imperial Academy of Sciences in 1891 and in 1897, at the same academy, professor of physiology in the physio-mathematical department. Pavlov founded a new school of Russian physiologists, his chief researches dealing especially with the physiology of the heart, secretion of the glands, digestion, and the production of gastric and pancreatic fluid. Following the investigations of Theodor von Bischoff, he improved on Heidenhain's method of producing a fistula and was thus able to demonstrate important observations in the flow of the fluid and digestion. Many of his ideas and experiments appeared in the works of his pupils. In 1904 he received the Nobel prize for medicine. Pavlov's works were written in Russian. That for which he received the 1904 Nobel prize in medicine was published in 1897 and was translated into German (1898), French (1901), and English (by W. H. Thompson in 1902, as *The Work of the Digestive Glands: Lectures*).

PAVLOVO, páv'ló-vó. An industrial town in the Government of Nizhni Novgorod, Russia, situated on the Oka, 40 miles southwest of Nizhni Novgorod (Map: Russia, F 3). It has steel works and match factories. There are a museum of cutlery and models and a library. Pop., 1897, 12,200; 1910, 20,000.

PAVLOWA, páv'ló-vá, ANNA (1886-). A Russian dancer, born in St. Petersburg and

trained in the Imperial Russian Ballet School under the famous master M. Fokine. She entered the school at 10, graduated in six years, and became prima ballerina at the Marianski Theatre. The fame of her dancing spread, and she resigned from the Imperial Ballet and made a continental tour, visiting Munich, Berlin, and Paris, finally reaching London in 1910. She was there proclaimed the most remarkable dancer since the days of Giulia Grisi and Fanny Elssler (qqv.). She toured America between 1913 and 1915, drawing immense crowds in New York and elsewhere. Pavlova's art left the fixed groove of her predecessors by disregarding sheer technique and making the dance a more natural and spiritual interpretation of the music to which it was set. Her best-known and most spectacular dance was the "Automne Bacchanale," an ecstatic revel; "The Swan" was another remarkable example of her work; while the interpretation of Liszt's "Les Preludes" by her company, with scenic setting by the Russian painter Boris Anisfeldt, combined all the best tendencies of the modern school.

PAVÓN, pa-vón', BATTLE OF. A battle fought in the town of Pavón in the Province of Santa Fé, Argentina, on Sept. 17, 1861, between the forces of the Province of Buenos Aires under General Mitre (qv) and those of the other provinces of Argentina under General Urquiza, for the supremacy of the Argentine Confederation. The former were completely successful and as a result General Mitre was elected President of the confederation.

PAVY, pā'vi, FREDERICK WILLIAM (1829-1911). An English physician, born at Wroughton, Wiltshire. He studied medicine at the University of London, graduating in 1853, and lectured at Guy's Hospital from 1856 to 1877. Pavy, who was especially interested in the function of the liver, asserting that this organ was not a storehouse of carbohydrates drawn upon at any time, had the largest practice in London in diabetic cases. Among his works are: *Recherches sur la destruction du sucre normal dans l'économie animale* (1854), a result of his studies with Claude Bernard; *Researches on the Nature and Treatment of Diabetes* (1862; 2d ed, 1869), *A Treatise on Foods and Dietetics* (1874; 2d ed, 1881), best known of all; *The Physiology of the Carbohydrates* (1894), *On Carbohydrate Metabolism* (1906).

PAWHUSKA, pa-hūs'ka. A city and the county seat of Osage Co., Okla., 60 miles southwest of Tulsa, on the Midland Valley Railroad (Map Oklahoma, E 2). It has an Indian agency and an Indian school. The city is situated in a productive farming and cattle-raising region. Oil and gas are found in the vicinity. Pawhuska has adopted the commission form of government. The water works and gas and electric-light plants are owned by the city. Pop., 1900, 2408; 1910, 2776.

PAWLE, pāl, J. LENNOX (1872-). An English actor, born in London. He studied at Sarah Thorne's Dramatic School at Margate, played in comedy at the Pavilion, Mile End, and between 1895 and 1905 appeared at various West End theatres in London. Afterward he was seen in *What Pamela Wanted* (1905) at the Criterion; *The Merry Widow* (1907) at Daly's; *The Babes in the Wood* (1907) at Drury Lane; *The Admirable Bashville* (1909) at His Majesty's, and *The Crisis* (1910) at

the New Theatre, all in London. In New York he gained attention (1910-11) by his captivating impersonation of Brooke-Hoskyn, the ex-butler in *Pomander Walk*, a play written by his father-in-law, Louis N. Parker. Subsequently he played in a revival of *Liberty Hall* (1913) and took the part of Micawber in Parker's *Highway of Life* (1914), a dramatization of Dickens's *David Copperfield*.

PAWLET, WILLIAM. See WINCHESTER, WILLIAM PAULET, MARQUIS OF.

PAWN. See BETEL.

PAWN'BRO'KING (from *pawn*, OHG. *pfant*, Ger. *Pfand*, pledge, from OF *pan*, pawn, pledge; usually considered identical with OF., Fr. *pan*, piece of a garment; more probably from OF. *paner*, Sp. *apandar*, to plunder, *apanar*, to take away + *broking*, connected with AS. *brūcan*, OHG. *brūhen*, Ger. *brauchen*, to use, need, Lat. *frui*, to use, enjoy). The business of lending money on the security of personal effects left in the possession of the lender. Pawnbroking has existed in some form in all ages and among all peoples. It is much older than banking, with which it was originally connected. The Chinese, Greeks, and Hebrews borrowed on pledges. In mediæval times pawnbroking was synonymous with the practice of lending money on usury. In Europe the business was carried on at first by Jews and later also by Lombards.

Pawnbroking is a legitimate business, but since the risk of loss and the expense of administering small loans are very great, the pawnbroker has often been allowed to charge a very high rate of interest. On the other hand, the fact that it lends itself easily to oppression has called for the strict regulation of the business by the state. In modern times these regulations have prescribed the maximum rate of interest that may be charged, what extra charges may be made, the period of redemption, and the manner of sale of unredeemed pledges. Recognizing the great disadvantage under which the poor borrower labors, efforts have been made to carry on the business in the interest of the borrowers. This effort has taken on the form of charitable lending agencies, known as *monts de piété* on the Continent. France is especially successful in maintaining these institutions. They are associated with town councils, hospitals, and charity bureaus. When endowed they charge no interest, and the highest interest exacted in these institutions is 12 per cent per annum. The Paris institution acts as the poor man's safe deposit, as it has excellent facilities for storage and makes a practice of disinfecting goods. Belgium follows French methods. The pawnbroking business has been controlled since 1618. The *monts de piété* are managed by town councils and charity administrators, while their funds are borrowed from the charity department.

Germany has royal, municipal, and private pawnshops. The private pawnshops are strictly regulated by law, and any city may prohibit them altogether. The municipal pawnshops are usually in connection with the savings banks and are self-supporting. In Austria-Hungary the business is still for the most part in private hands. The Imperial Pawnshop of Vienna, founded in 1707 by Joseph I, is now self-supporting. In Spain the *mont de piété* is connected with the savings bank. Sweden has had successful private companies since 1880. Few pawnshops are found in Switzerland, only one

in Bern. St. Petersburg and Moscow are the only cities of Russia maintaining municipal pawnshops.

The charter of the Bank of England gives that institution power to lend on plate and non-perishable commodities at 5 per cent. In 1695 the directors seriously considered establishing pawnshops, but the project was never carried into effect. Pawnbroking was first regulated under James I (1603), then under George III (1800). The business is now governed by the Pawnbrokers' Act, 1872 (35 and 36 Vict., c. 93), which restricts it to persons licensed to carry it on and regulates the method of conducting it.

In the United States the business has until recently been entirely in the hands of private pawnbrokers, who do business under State regulations or municipal ordinances. The State regulations usually provide for a license, a bond, regulation of interest charges, methods of sale, and the disposition of the surplus. The city ordinances often place the pawnshops under police control, providing for daily inspection or daily reports. Interest charges are regulated in most of the States. Two systems are in use: (1) an interest rate varying with the size of the loan; (2) a uniform rate, irrespective of the size of the loan. In the latter case extra charges are usually permitted, to cover the cost of handling small loans. The regulation of pawnbroking, whether by statute or by municipal ordinances, has proved a difficult task. Despite the mass of legislation dealing with the subject (there are said to be more than 400 different statutes and ordinances now in force in the United States which attempt to deal with the problem) cases of oppression are still common, due in large measure to the character of many of the persons who carry on the business. The only solution of the problem which holds out any hope of success is the gradual suppression of the private pawnshop and the assumption of the business by charitable or semicharitable institutions and by the municipal authorities. Municipal pawnshops were proposed for Philadelphia in 1816 by Dr. Mease. The oldest philanthropic concern in the United States is the Pawnors' Bank of Boston, started in 1859, which underwent many losses and discouragements. It is now the Collateral Loan Company and has paid a regular dividend of 8 per cent and more since 1890. The interest charge is 1 per cent a month. The number of loans made in a year exceeds 100,000, and the average amount per loan is about \$25. In 1892 a special committee of the Charity Organization Society of New York City recommended the formation of a company to loan on pledges, especially to borrowers approved by the Charity Organization Society. The company was incorporated in 1894 under the name of the Provident Loan Company, with a capital of \$100,000, later increased progressively and amounting to \$5,000,000 in 1910. Approximately half a million loans, averaging about \$30, are made annually. The society has regularly paid dividends of 6 per cent on capital stock. Interest charged on small loans is 1 per cent monthly; on sums of \$250 and over, 10 per cent annually.

After opposition from the pawnbrokers, who were well organized, Illinois passed a compromise measure, authorizing lending societies, but permitting loans only on personal property and

limiting the capital to \$50,000. The State Pawnors' Society opened its office in Chicago, Nov. 1, 1898. The society has a board of directors elected by the stockholders, with two additional members selected respectively by the Governor and the mayor. The maximum interest charged is 1 per cent per month, with an additional charge of $\frac{1}{2}$ per cent for storage and insurance. The pressure for loans has been heavy. The society pays 6 per cent dividends. At the time the office opened there were 67 pawnshops in Chicago. The Worcester Collateral Loan Association, the Workingmen's Loan Associations of Boston and Providence, the Provident Loan Company of Buffalo, and the Hebrew Free Loan Association of New York deal with chattel mortgages and indorsed loans.

Bibliography. R. H. Tyler, *Usury, Pawns, or Pledges* (Albany, 1873); *Report of Her Majesty's Representatives Abroad on Systems of Pawnbroking in Various Countries* (London, 1894); *United States Bulletin of Department of Labor*, No. 21 (Washington, 1899); Hettyer, *Das gegenwärtige öffentliche Leihaus in Deutschland* (Leipzig, 1907); "Leihhäuser," in Conrad, *Handwörterbuch der Staatswissenschaften* (Jena, 1909-11); S. W. Levine, *A Treatise on the Law of Pawnbroking* (New York, 1911); id., *The Business of Pawnbroking* (ib., 1913). See MONTS DE PIÈRE.

PAWNEE, pa-né'. The most important tribe of the Caddoan stock (q.v.) of North American Indians. They formerly claimed a large territory upon the Platte River, in what is now Nebraska, ranging from the Niobrara on the north to the Arkansas on the south and occasionally extending their forays far down into Texas or New Mexico. They were in chronic warfare with every surrounding tribe with the exception of the Omaha, Ponca, and Oto, whom they treated as wards and dependents.

The Pawnees call themselves Skihiksihiks (men of men, or superexcellent men). The popular name appears to be derived from the Pawnee *pariki* (a horn), referring to their peculiar scalp lock, which was dressed to stand nearly erect. This mark indicates a Pawnee in the pictographs of the plains tribes and undoubtedly also gave origin to the tribal sign, now interpreted to mean "Wolf People." They have four bands or grand divisions, viz., *Chaui*, or Grand (i.e., principal), *Kitkehaki*, or Republican, *Pitahauerat*, or Tapage (noisy), and *Skidi*, or Loup (wolf). The dialects of the Pawnee, Skidi, and Wichita are all so closely related as to constitute but one language. The Pawnee appear to have been known to the Spaniards as early as 1626. They are noted upon Marquette's map of 1673 about where they were found in 1804 by Lewis and Clark, viz., the lower Platte near its confluence with the Missouri. By treaty in 1833 they ceded their lands south of the Platte and came under the supervision of an agent. In 1838 the great smallpox epidemic carried off at least 2000 of their number, and in 1849 probably a greater number perished by cholera. Since then their history has been one of swift and certain decline from disease, removal, and unceasing warfare in which the Pawnee found every man's hand against him. They have never, however, as a tribe been at war with the whites, but, on the contrary, have frequently furnished a contingent of scouts in the various difficulties with the Northern plains tribes. One main factor

in the introduction of disease has been the great overland trail, which passed directly through their territory. In 1858 they ceded all their remaining original territory except a strip 30 miles long by 15 wide upon the Loup River. In 1874 they sold this and removed to their present location in Oklahoma.

Like all the tribes of Caddoan stock, the Pawnee were principally agricultural and sedentary, building large circular houses of logs covered with earth, and raising abundant crops of corn, pumpkins, and other Indian vegetables, which they dried or cached for winter use. The skin tepee was used only for temporary purposes when upon the buffalo hunt, away from their permanent villages. They are of good physique and somewhat more robust than the regular hunting tribes. They were devoted to religious ceremonials, the Skidi being particularly noted for their bloody rite of human sacrifice, offered to the Morning Star, as the spirit of fertility on the occasion of the annual corn planting, the victim being a captive girl. See *PETALESHARO*.

The best early estimate of their population is that by the missionaries Dunbar and Allis in 1835, who give them 10,000. In 1840, after the smallpox, the same authorities estimated them at about 7500. In 1847 they were about 8400, but were again terribly reduced by the great cholera epidemic in 1849. They now number 633. Consult: G. B. Grinnell, *Pawnee Hero Stories and Folk-Tales* (New York, 1889); Fletcher and Murie, *Hako: A Pawnee Ceremony* (Washington, 1901); G. A. Dorsey, *Traditions of the Skidi Pawnee* (Boston, 1904); id., *Pawnee Mythology*, part i, published by the Carnegie Institution (Washington, 1906).

PAWTUCKET. An important manufacturing city in Providence Co., R. I., 4 miles north of Providence, on both sides of the Pawtucket River, at the head of navigation, and on the New York, New Haven, and Hartford Railroad (Map: Rhode Island, C 2). Pawtucket covers an area of nearly 9 square miles. It has Daggett Park, Collyer Monument, and a Soldiers' Memorial Monument, several interesting bridges of various types, Sayles Memorial Library, Home for Aged Poor, Memorial Hospital, and a State armory. Among the more prominent business structures are the Safe Deposit Building, Industrial Trust Building, Providence County Savings Bank, Taylor Building, and Kinyon Block. Other points of interest are Ten-Mile River and Pawtucket Falls, 50 feet in height, noteworthy alike for beauty of scenery and as the source of great water power.

Pawtucket is well known for the extent and variety of its manufactures, which include cotton, silk, and woolen goods, plush, hosiery, velvet braid, webbing, various kinds of machinery, foundry products, gymnasium supplies, electrical supplies, thread, haircloth, yarns, paper, and wire. There are also numerous dyeing, bleaching, and finishing establishments. The total value of the city's output in 1909 was \$37,696,000, representing an invested capital of \$40,094,000 and giving employment to 16,261 persons. The government is vested in a mayor annually elected, a bicameral council, and in administrative officials, the majority of whom are elected by the council. The school committee is independently chosen by popular vote. Pawtucket spent in 1913 in maintenance and operation \$838,000. The principal items of

expense were \$78,000 for the operation of the water works, \$243,000 for schools, \$73,000 for the police department, \$86,000 for the fire department, and \$48,000 for sanitation. The water works, which were built in 1878 by the city at a cost of over \$1,840,000, are owned and operated by the municipality. Pop., 1890, 27,633; 1900, 39,231; 1910, 51,622; 1914 (U. S. est.), 56,901.

The portion of the city of Pawtucket on the west side of the river was originally the principal village in the town of North Providence, which was incorporated in 1765. This town was divided in 1874, and the village of Pawtucket was consolidated with the town of Pawtucket on the east side of the river as the town of Pawtucket, which in 1886 was incorporated as a city. The portion of Pawtucket on the east of the river was originally in Massachusetts and was incorporated as the town of Pawtucket in 1828, having been set off from the parent town of Seekonk. In 1862 the town of Pawtucket, Mass., was ceded to Rhode Island and remained a separate town until its consolidation with the village of Pawtucket in North Providence in 1874. The first cotton factory in the United States was established here in 1790 by Samuel Slater. This mill, in which it is claimed the first Sunday school in the country was founded, is still standing. Consult W. A. Greene, *The Providence Plantations* (Providence, 1886), and Robert Grieve, *Illustrated History of Pawtucket* (Pawtucket, 1897).

PAX (Lat., peace), called also **PACIFICALE** and **OSCULATORIUM**. The "kiss of peace," and also a sacred utensil, employed in some of the solemn services of the Catholic church in the ceremony of giving the so-called "kiss of peace" during the mass. The practice of saluting each other—the men, men, and the women, women—during public worship, and particularly in the *agape*, or love feast, is frequently alluded to by ancient writers, as Cyril of Jerusalem, and Augustine. All the ancient liturgies without exception refer to it as among the rites with which the eucharist was celebrated; but they differ as to the time and the place in the eucharistic service in which it is introduced. The ceremony commences with the celebrating bishop or priest, who, after kissing the altar, salutes the deacon, not (in modern times) by an actual kiss, but by placing the hands upon his shoulders and slightly inclining the head towards him. By the deacon the salute is tendered to the other clergy assisting. Originally the laity also were included, but this has long since been abandoned. It is when the mass is celebrated by a high dignitary that the utensil called the pax is used. The pax is sometimes a crucifix, sometimes a reliquary, sometimes a tablet with a figure sculptured or enameled upon it. Having been kissed by the celebrant and by him handed to the deacon, it is carried by the latter to the rest of the clergy. The pax is omitted in the mass of Maundy Thursday (q.v.), to express horror of the treacherous kiss of Judas.

PAX (pseudonym). See **CHOLMONDELEY, MARY**.
PAXIUBA (pá'shé-oo'bá) **PALM**. See **IRIARTEA**.

PAXOS, pák'sós, or **PAXO**. One of the Ionian Islands (q.v.) (Map: Greece, B 4). It is 9 miles south of Corfu and about as far from Acarnania, Greece. It is about 5 miles long and

2 miles broad and is mainly a hilly mass of limestone, rising to 600 feet, with an absence of potable water. The sea has carved some remarkable caverns in its west and southwest coast. It is noted for its fruit and the fine quality of its olive oil. Goats and mules are raised. Pop., 1907, 4120.

PAXSON, FREDERICK LOGAN (1877-). An American historian, born in Philadelphia. He graduated from the University of Pennsylvania (B.S., 1898; Ph.D., 1903), and took an A.M. at Harvard in 1902. From 1903 he taught history successively in the universities of Colorado (till 1906), Michigan (1906-10), and Wisconsin, his special field being American history. He was also professor in the summer schools of the universities of Chicago (1909) and California (1913) and in 1910 was abroad as a research associate of the Carnegie Institution. His publications include: *The Independence of the South American Republics* (1903); *The Last American Frontier* (1910); *The Civil War* (1911), *Guide to Materials for United States History since 1783 in London Archives*, with C. O. Paullin (1914), *The New Nation* (1915).

PAXTON. A city and the county seat of Ford Co., Ill., 101 miles south of Chicago, on the Illinois Central and the Lake Erie and Western railroads (Map: Illinois, H 4). The most prominent buildings are the Carnegie library and the courthouse. Among the industrial establishments are furniture, canning, broom, and tile factories. Pop., 1900, 3036, 1910, 2912.

PAXTON, SIR JOSEPH (1801-65) An English architect and horticulturist, born at Milton-Bryant, near Woburn, Bedfordshire. As superintendent of the gardens of Chatsworth, in the employ of the Duke of Devonshire, he de-

Boston, where he first attracted attention in 1899 with a portrait of his wife, and where in 1906 he was appointed instructor in the art school of the Fine Arts Museum. He represents conservative tendencies in American art. His painting is solid and direct, well drawn and healthily realistic, but lacking in subtlety of color. Among his best-known paintings are "A Girl Sweeping" (Pennsylvania Academy), "Tea Leaves" and "Sylvia" (both in the Metropolitan Museum, New York), "The Pearl Necklace," "Cherry," and a portrait of President Cleveland.

PAXWAX. See LIGAMENT.

PAY AND ALLOWANCES. A term used to denote the rate of pay and allowances granted to officers and enlisted men of the military and naval services of the United States.

UNITED STATES ARMY

Allowances to officers and enlisted men are made on a basis of requirement and rank and may be either in kind or in cash in lieu of the amount to which such officer or soldier by regulation is entitled. The money allowance of clothing is allotted half-yearly for the first year, estimates for clothing being made quarterly as follows: on January 1 for a supply to last until June 30, on April 1 until September 30, on July 1 until December 31, on October 1 until March 31. Commanding officers settle the clothing accounts of their men six months after enlistment and afterward on June 30 and December 31 of each year. (For allowances of forage, see FORAGE.) Soldiers receiving cash or commutation in lieu of food (ration) are paid according to a scale which varies in amount from 25 cents per diem, allowed enlisted men on conclusion of furlough,

TABLE OF PAY (1915) ALLOWED BY LAW TO OFFICERS OF THE ARMY

GRADE	PAY OF OFFICERS IN ACTIVE SERVICE						PAY OF RETIRED OFFICERS					
	PAY OF GRADE		MONTHLY PAY				PAY OF GRADE		MONTHLY PAY			
	Yearly	Monthly	After 5 years' service	After 10 years' service	After 15 years' service	After 20 years' service	Yearly	Monthly	After 5 years' service	After 10 years' service	After 15 years' service	After 20 years' service
			10%	20%	30%	40%						
Lieut. general	\$11,000	\$916 67					\$8,250	\$687 50				
Major general	8,000	666 67					6,000	500 00				
Brig. general	6,000	500 00					4,500	375 00				
Colonel	4,000	333 33	\$366 67	\$400 00	\$416 67	\$416 67	3,000	250 00	\$275 00	\$300 00	\$312 50	\$312 50
Lieut. colonel	3,500	291 67	320 83	350 00	375 00	375 00	2,625	218 75	240 62	262 50	281 25	281 25
Major	3,000	250 00	275 00	300 00	325 00	333 33	2,250	187 50	206 25	225 00	243 75	250 00
Captain	2,400	200 00	220 00	240 00	260 00	280 00	1,800	150 00	165 00	180 00	195 00	210 00
First lieutenant	2,000	166 67	183 33	200 00	216 67	233 33	1,500	125 00	137 50	150 00	162 50	175 00
Second lieutenant	1,700	141 67	155 83	170 00	184 17	198 33	1,275	106 25	116 87	127 50	138 12	148 75

signed the large conservatory of Chatsworth (1836-40). This experience led him to propose a "crystal palace" of glass and iron for the great London Exhibition of 1851. It was the first time these materials had been employed on so extensive a scale. His design obtained for him great popularity and the honor of knighthood. The Crystal Palace of 1851 was removed from Hyde Park, but became the germ of the more splendid palace at Sydenham, the construction of which he superintended in 1862, the grounds were also laid out by him.

PAXTON, WILLIAM MCGREGOR (1869-). An American portrait and genre painter. He was born in Baltimore and studied under Denis Bunker in Boston and at the Ecole des Beaux-Arts in Paris under Gérôme. Paxton settled in

\$1 per diem to sergeants of post non-commissioned staff, on duty at stations where there are no other troops; \$1 per diem to a soldier on detached duty, to \$1.50 per diem to a soldier traveling under orders from a station, where his rations have been regularly commuted—which is the maximum allowance in lieu of rations for enlisted men. A specified weight of baggage, according to grade, is transported at public expense for officers and enlisted men both in change of station and in the field. Officers and certain grades of enlisted men also have a fuel and light allowance. See BAGGAGE, MILITARY.

Whenever there are sufficient quarters in a barracks or station, permanent quarters are assigned to the field and staff officers of the garri-

son. Regimental officers are provided with quarters according to convenience of location and the rank of the recipient. Bachelor quarters are assigned to officers without families. On the ar-

called commutation, in lieu of quarters are paid at the rate of \$12 per room, the number of rooms being in accordance with grade.

For allowances of food and ration, see RA-

TABLE OF MONTHLY PAY (1915) OF ENLISTED MEN OF THE UNITED STATES ARMY

RANK AND ARM OF SERVICE	First enlistment	Second enlistment*	IF REENLISTED WITHIN THREE MONTHS				
			Third enlistment	Fourth enlistment	Fifth enlistment	Sixth enlistment	Seventh enlistment
CORPS, REGIMENT, BATTALION							
Master signal electrician	\$75	\$79	\$83	\$87	\$91	\$95	\$99
Master electrician—coast artillery, quartermaster corps							
Engineer—coast artillery							
First-class electrician sergeant—coast artillery	65	69	73	77	81	85	89
Battalion sergeant major, quartermaster sergeant—engineers	45	49	53	57	61	65	69
Regimental sergeant major, quartermaster sergeant, commissary sergeant—field artillery, cavalry, infantry							
Senior sergeant major—coast artillery							
Battalion sergeant major—field artillery, infantry	40	44	48	52	56	60	64
Squadron sergeant major—cavalry							
Battalion quartermaster sergeant—field artillery							
Junior sergeant major—coast artillery	36	40	44	48	52	56	60
Master gunner—coast artillery							
Second-class electrician sergeant—coast artillery							
Color sergeant—field artillery, cavalry, infantry	30	33	36	39	42	45	48
Firemen—coast artillery							
BATTERY, TROOP, COMPANY							
Sergeant, first class—signal corps, quartermaster corps	45	49	53	57	61	65	69
First sergeant—artillery, cavalry, infantry, engineers							
Sergeant—engineers, ordnance, signal corps, quartermaster corps							
Quartermaster sergeant—engineers	36	40	41	48	52	56	60
Cook—artillery, cavalry, infantry, engineers, signal corps, quartermaster corps	30	33	36	39	42	45	48
Sergeant—artillery, cavalry, infantry							
Quartermaster sergeant—artillery, cavalry, infantry							
Stable sergeant—field artillery	24	27	30	33	36	39	42
Horseshoer—cavalry, field artillery							
Corporal engineers, ordnance, signal corps, quartermaster corps							
Mechanic—coast artillery	21	24	27	30	33	36	39
Chief mechanic—field artillery							
Corporal—artillery, cavalry, infantry							
Artificer—infantry	18	21	24	27	30	33	36
Mechanic—field artillery							
Farrier, saddler, wagoner—cavalry							
Private, first class—engineers, ordnance, signal corps, quartermaster corps	15	18	21	22	23	24	25
Trumpeter—cavalry	15	18	21	22	23	24	25
Musician—artillery, infantry, engineers							
Private—artillery, cavalry, infantry, signal corps, quartermaster corps							
Private, second class—engineers, ordnance							
BANDS—ARTILLERY, CAVALRY, INFANTRY, ENGINEERS							
Chief musician	75	79	83	87	91	95	99
Chief trumpeter—artillery, cavalry	40	44	48	52	56	60	64
Principal musician	36	40	44	48	52	56	60
Sergeant							
Drum major							
Cook	30	33	36	39	42	45	48
Corporal	24	27	30	33	36	39	42
Private							
POST NONCOMMISSIONED STAFF							
Ordnance sergeant	45	49	53	57	61	65	69
Quartermaster sergeant—quartermaster corps							
HOSPITAL CORPS							
Sergeant, first class	50	54	58	62	66	70	74
Sergeant	30	33	36	39	42	45	48
Acting cook	24	27	30	33	36	39	42
Corporal	18	21	24	27	30	33	36
Private, first class	16	19	22	23	24	25	26
Private							

* Discharged at termination of enlistment and reenlisted after three months, entitled pay of second enlistment.—[Act May 11, 1908]

rival of a command at a new station the original assignment of quarters is made by a board of officers consisting of the commanding officer, the two senior line officers present, the senior surgeon, and the quartermaster. Money allowances,

tion. The use of public horses by officers required to be mounted is regulated by department commanders, according to local exigencies. Officers below the grade of major required to be mounted, whether permanently or temporarily,

will be furnished with a proper mount by the quartermaster corps. Such officers may, however, provide themselves with suitable mounts at their own expense and of their exclusive ownership, and any officer of the grades indicated who so provides himself receives \$150 per annum additional pay for one mount and \$200 if he provides two. The sum of \$100 is allowed for the transport of each horse entitled to forage, and an attendant to accompany them. If such sum does not cover the actual cost, the excess must be refunded by the owner. When traveling under orders without troops on land, an officer is allowed mileage at 7 cents per mile; actual expenses only for sea travel.

In the British army, where the rates of pay are lower than in the United States, service in India is made more attractive by the numerous opportunities it offers for extra pay, originally commonly described as "batta." Allowances also are paid at a higher rate than at home.*

Half Pay is practically any form of reduced pay, and the term is still frequently used to describe the rate of pay of a retired or disabled officer.

UNITED STATES NAVY

Officers appointed from civil life are credited with five years' service in computing their rates of pay. This is to make some allowance for their educational period.

TABLE OF PAY OF COMMISSIONED OFFICERS OF THE NAVY

GRADE	Pay on shore duty	Pay on sea duty
Admiral of the Navy	\$13,500	\$13,500
Admiral*		10,000
Vice admiral*		9,000
Rear admiral (first nine)	8,000	8,800
Rear admiral (second nine)	6,000	6,600
Captain	4,000	4,400
Commander	3,500	3,850
Lieutenant commander	3,000	3,300
Lieutenant	2,400	2,640
Lieutenant, junior grade.	2,000	2,200
Ensign.	1,700	1,870

* The ranks of admiral and vice admiral are held by rear admirals while in command of a fleet or second in command.

† The foregoing rates of pay for officers below the grade of rear admiral are termed "base pay." In addition to this these officers receive 10 per cent of the base pay for each five years' service; but the total additions must not exceed 40 per cent of the base pay, and the pay of captains must not exceed \$5000, that of commanders \$4500, and that of lieutenant commanders \$4000.

‡ The pay of officers performing sea duty or shore duty beyond seas is 10 per cent in excess of their ordinary pay (base pay plus longevity additions). Thus, all captains (having served over 20 years) receive \$5000 when on shore duty in the United States. When at sea or on shore duty beyond seas they receive \$5500.

Officers on aviation duty are allowed 35 per cent increase of pay. This includes all allowances for quarters, heat, light, etc.

All naval officers on shore duty are given the same allowances for quarters, heat, and light as army officers of equal relative rank. See UNITED STATES, Navy.

Midshipmen at the naval academy receive \$600 per annum and 30 cents a day as ration money.

Officers on the retired list receive 75 per cent of their pay at time of retirement, one-half sea pay, or one-half leave pay, depending upon the circumstances of retiring. Commodores on the retired list receive the same pay as rear admirals of the second nine.

TABLE OF PAY OF WARRANT OFFICERS, PAYMASTERS' CLERKS, AND MATES

	At sea	Shore duty	Leave or waiting orders
WARRANT OFFICERS AND PAYMASTERS' CLERKS:			
First 3 years' service	\$1,500	\$1,125	\$875
Second 3 " "	1,825	1,250	1,000
Third 3 " "	1,750	1,625	1,125
Fourth 3 " "	2,000	1,625	1,250
After 12 " "	2,250	2,000	1,500
MATES:			
In service Aug. 1, 1894.	1,500	1,125	875
Appointed since	1,125	875	625

Warrant officers include boatswains, gunners, carpenters, sailmakers, pharmacists, and machinists. Chief warrant officers receive the same pay and allowances as ensigns. Warrant officers, paymasters' clerks, and mates receive 30 cents a day as ration money.

Officers of the Marine Corps. The officers of the marine corps receive the same pay and allowances as officers of the army.

TABLE OF PAY OF NURSE CORPS, UNITED STATES NAVY

Superintendent.	\$1800 per annum
NURSES:	
First 3 years' service	\$50 per month
Second " "	65 " "
Third " "	60 " "
After 9 " "	65 " "

Nurses assigned to duty as chief nurses receive \$30 per month extra. Nurses who subsist themselves are entitled to 40 cents a day in lieu of ration. When not furnished quarters, they are allowed \$15 per month for quarters. Nurses serving outside the United States (except in Cuba, Porto Rico, and Hawaii) are entitled to 10 per cent additional pay. Nurses are entitled to the same traveling allowances as members of the nurse corps of the army.

In addition to the foregoing rates of pay, each enlisted man receives 10 per cent additional pay. If his base pay is increased for any one of the following reasons, then the 10 per cent is computed on the total base pay plus increase:

(a) Each good-conduct medal (see GOOD-CONDUCT BADGE), pin, or bar entitles the holder to 75 cents per month.

(b) Upon reenlistment \$5 per month is added to the pay of the rating held; upon all subsequent reenlistments \$3 per month is added.

(c) Honorable discharge in the previous enlistment carries with it an increase of pay of \$1.36 per month.

(d) Seamen gunners' certificate.

The following temporary appointments carry pay as indicated, in addition to the pay of the ratings held: coxswains of steam launches, \$5 per month; seamen in charge of hold, \$5; messmen, \$5; signalmen, first class, \$3; signalmen, second class, \$2; signalmen, third class, \$1; heavy-gun pointers, first class, \$10; heavy-gun pointers, second class, \$6; intermediate-gun pointers, first class, \$8; intermediate-gun pointers, second class, \$4; secondary-battery gun pointers, first class, \$4; secondary-battery gun pointers, second class, \$2; gun captains, \$5; graduate of gun captains' school, \$2; ships' tailor, \$20, \$15, or \$10, according to size of ship; navy mail clerk, \$20, \$15, \$5, according to size

of ship; assistant mail clerk (on large ships only), \$15; certificate of graduation as cooks or stewards, \$5; divers' pay, \$1.20 per hour.

At the end of each enlistment every enlisted man is entitled to four months' leave with pay, if he enlists again within four months from date of discharge. If he does not take the leave,

his Arctic experience with excellent technique and broad solid handling. They include "The Bay of Death," the best of four pictures illustrating the Franklin expedition, and "Never Retreat" (Modern Gallery, Vienna). For the Museum of Natural History in Vienna he executed mural paintings, "Views in Franz Josef

TABLE OF PAY OF THE ENLISTED FORCE OF THE NAVY (BASE PAY ONLY)

RATING	Monthly pay	RATING	Monthly pay	RATING	Monthly pay
SEAMAN BRANCH, petty officers					
Chief masters-at-arms . . .	\$65*	Shipfitters, first class . . .	\$55	Yeomen, second class	\$35
Chief gunners' mates . . .	50*	Electricians, first class . . .	50	Ships' cooks, second class . . .	40
Chief turret captains . . .	50*	Blacksmiths	50	Yeomen, third class	30
Chief boatswains' mates . . .	50*	Plumbers and fitters . . .	45	Hospital apprentices, first class	30
Chief quartermasters . . .	50*	Sailmakers' mates	40	SPECIAL BRANCH, not petty officers	
Masters-at-arms, first class	40*	Carpenters' mates, first class	40	Musicians, first class	\$32
Boatswains' mates, first class	40	Water tenders	40	Ships' cooks, third class . . .	30
Gunners' mates, first class . .	40	Painters, first class	40	Bakers, second class	35
Turret captains, first class . .	50	Machinists' mates, second class	40	Musicians, second class . . .	30
Quartermasters, first class . .	40	Electricians, second class . .	40	Buglers	30
Masters-at-arms, second class	35	Shipfitters, second class . . .	40	Hospital apprentices	20
Boatswains' mates, second class	35	Oilers	37	Ships' cooks, fourth class . .	25
Gunners' mates, second class . .	35	Carpenters' mates, second class	35	Landsmen	16
Quartermasters, second class . .	35	Printers	35	MESSMEN BRANCH	
Masters-at-arms, third class . .	30	Painters, second class . . .	35	Stewards to commanders in	
Coxswains	30	Electricians, third class . . .	30	chief	\$60
Gunners' mates, third class . .	30	Carpenters' mates, third class	30	Cooks to commanders in chief	50
Quartermasters, third class . .	30	Painters, third class	30	Stewards to commandants . .	60
SEAMAN BRANCH, not petty officers					
Seamen gunners	\$26	ARTIFICER BRANCH, not petty officers			
Seamen	24	Firemen, first class	\$35	Cooks to commandants	50
Ordinary seamen	19	Shipwrights	25	Cabin stewards	50
Apprentice seamen	16	Firemen, second class . . .	30	Cabin cooks	45
ARTIFICER BRANCH, petty officers					
Chief machinists' mates . . .	\$70	Coal passers	22	Wardroom stewards	50
Chief electricians	60*	Landsmen	16	Wardroom cooks	45
Chief carpenters' mates . . .	50*	SPECIAL BRANCH, petty officers			
Chief water tenders	50	Chief yeomen	\$60*	Steerage stewards	35
Boiler makers	65	Hospital stewards	60	Steerage cooks	30
Machinists' mates, first class	55	Bandmasters	52	Warrant officers' stewards . .	35
Coppersmiths	55	Chief commissary stewards . .	70	Warrant officers' cooks . . .	30
		Yeomen, first class	40	Mess attendants, first class . .	30
		First musicians	36	Mess attendants, second	
		Commissary stewards	60	class	25
		Ships' cooks, first class . . .	55	Mess attendants, third class . .	20
		Bakers, first class	45		

* Chief petty officers of all kinds, who have passed the requisite examinations and been given permanent appointments, receive \$70 per month.

he is given four months' pay upon reenlistment.

An enlisted man of the navy may retire after 30 years' service. His pay upon retirement is 75 per cent of the full pay received at that time, plus 75 cents per month for each good-conduct medal or bar. For men leaving the service before 30 years, see NAVAL RESERVE.

Enlisted Force of the Marine Corps. Enlisted men of the marine corps receive the same pay and allowances as enlisted men of the army. Men regularly detailed as gun pointers, gun captains, navy mail clerks, messmen, or signalmen, or holding good-conduct medals, pins, or bars, receive the extra compensation allowed to enlisted men of the navy for these services.

PAYER, pi'ér, JULIUS VON (1842-1915). An Austrian polar explorer and painter. He was born at Schönan, near Teplitz, Bohemia, and was educated in the military academy at Wiener-Neustadt. Commissioned in the army (1859), he later distinguished himself in Alpine surveys. In 1869-70, taking part in the second German expedition to the North Pole, he explored Fligely Fiord, East Greenland, and adjacent regions. With Weyprecht, in the Austro-Hungarian expedition, he discovered and explored Franz Joseph Land (consult his *Die oesterreichisch-ungarische Nordpolexpedition in den Jahren 1872-74*, 1876). On his return he devoted himself entirely to painting, studying for two years in Frankfort under Hasselhorst, three years in Munich under Wagner, and four years in Paris. From the first he worked on large canvases, painting stirring episodes from

Land." He won gold medals in Munich (1883), Berlin (1886), and Paris (1889).

PAYMASTER. An officer in the military or naval service charged with the payment of troops and other duties involving the receipt and disbursement of public funds. The payment of troops of the United States army is made by an officer of the quartermaster corps (q.v.) who is designated as such and not as a paymaster.

In the United States navy each large vessel has a paymaster and one or two pay clerks. He has charge of the public funds carried, the clothing and provisions for the enlisted men, and stores for all departments of the ship except small quantities issued for current use; and he makes such purchases as may be ordered by the commanding officer. He is the commissary officer of the ship and has charge of the purchase, preparation, and service of provisions for the men. At shore stations a paymaster may be the pay officer, keeper of the general store (in which are supplies for all departments of the station), or is the accounting officer for the care of manufacturing costs.

There are paymasters in practically all foreign navies, but their duties vary. In some services they are pay officers and accountants only; in others they perform commissary duties, are storekeepers in charge of supplies, purchasers of supplies, secretaries to flag officers, etc. The numbers in the navies of the Great Powers were greatly increasing during the European War of 1914 and are constantly changing. On July 1, 1914, they were: Great Britain, 686;

Germany, 267; France, 219; Japan, 362; Italy, 239; Austria, 184.

PAYMASTER-GENERAL. An officer of the British ministry, but not of the cabinet, charged with superintending the issue of all moneys voted by Parliament. He has no control over the sums issued, paying merely on the order of the department concerned. He is always either a peer or a member of the House of Commons and changes with the ministry. The paymaster-general is not paid, but he is assisted by a deputy and a staff of clerks, and the annual cost of the whole department amounts to about £25,000.

PAYMASTER'S CLERK, U. S. N. See CLERK, PAYMASTER'S.

PAYMENT. In law, the satisfaction or discharge of a legal obligation by the delivery of money, or something which the creditor accepts in lieu of money. But a creditor is not bound to take a check, bill of exchange, or promissory note, nor anything but money (legal tender) in payment of a debt. If he accepts a bill or note, it is regarded as conditional payment only, unless he expressly agrees to take it in absolute payment. Payment is therefore employed in a more limited sense than performance, which implies the fulfillment of any legal obligation, as carrying out the provisions of an agreement or contract to do work or furnish materials to another. In order to be effectual, payment must be made to the proper party, i.e., either to the one to whom it is due personally or to some other person lawfully authorized by him to receive it, and it must be of the exact amount due. It should be made at the exact time and place agreed upon, or implied by law, in order to avoid a claim for interest from that time, or the commencement of an action. In general where no place for payment has been previously agreed upon by the parties, the debtor must seek the creditor, or he may be considered as in default. The chief consequences which may ensue on a default of payment are, in general, to give the creditor the right to have immediate recourse to any security, as to sell an article pledged as security, or to foreclose a mortgage or other lien, and if the contract is a continuing one and payments become due in installments to rescind the contract, to refuse to proceed further, and sue the debtor for the amount then due and unpaid. Where payment is made to one of several joint creditors, the debtor is discharged, even though the one to whom he paid it does not account to his fellow creditors. The effect of a valid payment is to discharge the debtor from his obligation. But payment of a debt by a third person without the authority of the debtor does not operate to discharge the debt unless such payment is ratified by the debtor; neither does the payment by the debtor of less than the full amount of his debt, even though such less amount was accepted by the creditor as payment in full. Consult the authorities referred to under CONTRACT. See CREDITOR; DEBTOR; LEGAL TENDER.

PAYMENTS, EQUATION OF. See EQUATION OF PAYMENTS.

PAYN, JAMES (1830-98). An English novelist. He was born in Cheltenham, graduated at Trinity College, Cambridge, in 1852, and adopted literature as a profession. He contributed largely to periodicals, became coeditor with L. Ritchie of *Chambers's Journal* in 1858, and in the following year was made sole editor,

which position he held until 1874. From 1883 to 1896 he was the successor of Leslie Stephen as editor of the *Cornhill Magazine*. The novel *Lost Sir Massingberd* (1864) was the first of his works to attract attention, and after its appearance he published more than 70 novels, among which are *Cecil's Tryst* (1872), *Fallen Fortunes* (1876), *By Proxy* (1878), *A Grapic from a Thorn* (1881), *The Heir of the Ages* (1886), *The Eavesdropper* (1888), *Gleams of Memory* (1894), *In Market Overt* (1895), *Another Burden* (1897), and a collection of essays, *The Backwater of Life* (1899), published posthumously with an introduction by Leslie Stephen.

PAYNE, CHARLES HENRY (1830-99). An American Methodist Episcopal clergyman and educator, born at Taunton, Mass. He graduated from Wesleyan University in 1856 and then studied at the Biblical Institute, Concord, N. H., for a short time. He entered the ministry in 1857. His life was spent in the pastorate until 1876, after which for 12 years he was president of Ohio Wesleyan University. From 1888 till his death he was secretary of the board of education of his church. Dr. Payne was a member of various important Methodist conferences and a member of the committee on the revision of the *Methodist Hymnal* in 1876. He was the author of *Guides and Guards in Character Building* (1882); *Daniel the Uncompromising Young Man* (1883); *The Saloon or the Sabbath, Which?* (1894).

PAYNE, HENRY B. (1810-96). An American politician and capitalist, born at Hamilton, N. Y. He graduated at Hamilton College in 1832 and two years later began to practice law at Cleveland, Ohio. In 1849 he was elected to the State Senate by the Democrats and was their candidate for United States Senator in 1851 and for Governor in 1857. At the Charleston convention in 1860 he exerted his influence to check the secession movement and during the Civil War remained a strong Union man. In 1872 he led the Ohio delegation at the Baltimore convention which nominated Horace Greeley for the presidency. Two years later he was elected to Congress by a fusion of Democrats and Liberal Republicans and was one of the representatives of the House on the Electoral Commission in 1877. He was elected United States Senator in 1884 and served from 1885 until 1891. He was for many years interested in various industrial, railroad, and mining projects and accumulated a large fortune.

PAYNE, HENRY CLAY (1843-1904). An American political leader and cabinet officer. He was born at Ashfield, Mass., was educated at Shelburne Falls Academy, and in 1859 entered business in Northampton. In 1863 he removed to Milwaukee, Wis., where he established himself as a merchant, and where from 1875 to 1885 he was postmaster. Subsequently he acquired large interests in electric-railway and lighting companies. In 1886 he became president of the Wisconsin Telephone Company, after 1887 he was for several years president of the Milwaukee and Northern Railroad, and in 1893 he was appointed one of the receivers for the Northern Pacific. Meanwhile he gained success as a political manager, serving for many years as chairman of the Wisconsin Republican State Central Committee. In 1880 he became a member of the Republican National Committee

and of its executive committee, and as vice chairman he conducted presidential campaigns in the West in 1896 and 1900. In 1897 he was offered the post of Ambassador to Germany by President McKinley, but declined. From 1902 until his death he was Postmaster-General in President Roosevelt's cabinet.

PAYNE, JOHN (1842-). An English poet and translator. A solicitor by profession, he retired to a life devoted to literature. He was one of a cluster of Neo-Romantic poets inspired by Rossetti, Morris, and Swinburne, others of the group being Théodor Marzials and Arthur O'Shaughnessy (qq.v.). Payne's verse comprises: *A Masque of Shadows* (1871); *Intaglios* (1870), a sonnet sequence; *Songs of Life and Death* (1872); *Lautrec* (1878), a vigorous narrative poem; *New Poems* (1880). For the Villon Society he translated Villon's *Poems* (1878). He also translated *Arabian Nights* (9 vols., 1882-84); *Tales from the Arabic* (1885); *Aladdin and the Enchanted Lamp* (1885); Boccaccio's *Decameron*; *Quatrains of Omar Khayyam* (1898); *Poems of Shemseddin Mohammed Hafiz of Shiraz* (3 vols., 1901); *Flowers of France* (1907), translations of representative French poems from Ronsard to Saint-Amant. *The Poetical Works of J. Payne* appeared in two volumes (London, 1902), and *Selections from the Poetry of John Payne* (New York, 1906) was edited, with an introduction, by Tracy and Lucy Robinson.

PAYNE, JOHN HOWARD (1791-1852). An American actor and playwright, best known, however, as the author of *Home, Sweet Home*. Born in New York, he lived in childhood at East Hampton, L. I. Payne showed great precocity. At 13 years of age, while a clerk in a mercantile house in New York, he secretly edited a weekly paper, the *Thespian Mirror*. He was a student of Union College, when the bankruptcy of his father interrupted his education, and he decided to go on the stage as the best means of supporting the family. He made his debut at the Park Theatre, New York, Feb. 24, 1809, as Young Norval in *Douglas*. This enterprise proved an artistic and pecuniary success, and he subsequently appeared before large and enthusiastic audiences in Boston, Philadelphia, and Baltimore. In 1813 he sailed for England and made his appearance in London at Drury Lane Theatre as Master Payne, "the American Roscius," in his original part of Young Norval. His performances were well received by the public. After this he supported himself in England as actor, manager, and playwright, but, owing to his lack of business ability, was often in financial embarrassments. In 1815 Payne published in London a selection of poems called *Lispings of the Muse*. His fugitive writings, besides verse, include many articles in criticism, one of the best known being an essay on "Our Neglected Poets," published in the *Democratic Review* in 1838.

Payne adapted many plays from the French and produced a number of original ones, among them *Brutus*, or *the Fall of Tarquin*, *Thérèse*, *Virginia*, and the comedy of *Charles II*. The song *Home, Sweet Home* occurs in his opera of *Clari*, or *the Maid of Milan*, which was produced at the Covent Garden Theatre in May, 1823. The music was adapted by Henry R. Bishop from an old melody which Payne had heard in Italy. The publishers of this song are said to have cleared 2000 guineas by it within a year,

and the opera was very successful; by all this, however, Payne himself profited but little. In 1826-27 he edited in London a periodical called the *Opera Glass*. In 1832 he returned to America. He was appointed American Consul at Tunis, Africa, in 1842, was recalled in 1845, and reappointed in 1851. He died there April 9, 1852, and was buried in the cemetery of St. George at Tunis. In 1883 his remains were brought to Washington. Consult: G. Harrison, *John Howard Payne* (new ed., Philadelphia, 1885); C. H. Brainard, *John Howard Payne: A Biographical Sketch* (Washington, 1885); W. T. Hanson, *Early Life of John Howard Payne* (Boston, 1913).

PAYNE, JOSEPH (1808-76). An English educator, born at Bury St. Edmunds. He was chiefly self-educated and in 1830 founded a school that developed into the successful Denmark Hill Grammar School for boys. In 1845 he and his wife founded the Mansion House School at Leatherhead and stayed there up to their retirement to Bayswater, London, in 1863. Payne's educational ideas were founded upon those of Jacotot, and he wrote in condemnation of the Eton system. In 1872 at the College of Preceptors he became the first English professor of the theory and practice of education. His works were edited by his son, Dr. J. F. Payne, and published in two volumes: *Lectures on the Science and Art of Education* (1883) and *Lectures on the History of Education, with a Visit to German Schools* (1892).

PAYNE, OLIVER HAZARD (1842-). An American capitalist, the benefactor of Cornell Medical School and other institutions. He was born in Cleveland, Ohio, graduated from Yale University in 1863, and, entering the 124th Ohio Infantry as first lieutenant in 1862, became colonel in 1863, and was brevetted brigadier general of volunteers in 1865. From 1866 to 1884 he was an iron manufacturer and oil refiner in Cleveland and subsequently was engaged in the same business in New York City. He became a director of the Standard Oil Company and of the American Tobacco Company and vice president of the Tennessee Coal, Iron, and Railroad Company. Payne gave \$500,000 to help establish and maintain the Cornell University Medical School, subsequently contributed largely to its support, and in 1913 provided an endowment of \$4,500,000. He also made large gifts to the University of Virginia and to Western Reserve University.

PAYNE, PETER (c.1380-1455). An English Lollard, born near Grantham in Lincolnshire. He studied at Oxford, where he became a follower of Wiclif and was principal of St. Edmund Hall (1410-14). At a time when the professing and teaching of Wicliffe doctrine demanded the highest moral courage Payne did not hesitate, and in 1416 he was excommunicated, having failed to appear for trial on the charge of heresy. In complete sympathy with the adherents of John Huss, he fled from England to Prague, where Elizabeth of Bohemia, widow of King Wenceslas, protected him and where he became a prominent member of the Taborite party. (See TABORITES.) As such he appeared in many religious conferences and by his extreme views did much to block a union of quarreling sects. The story of the latter years of his life, which were passed in Bohemia, is full of confusing detail, and it is uncertain whether Payne submitted after the defeat of

the Taborites. All of his writings dealt with the defense of Wiclif's teachings. Consult Baker, *A Forgotten Great Englishman* (London, 1894).

PAYNE, SERENO ELISHA (1843-1914). An American lawyer and legislator, born at Hamilton, N. Y. He graduated from the University of Rochester in 1864 and, after studying law privately, was admitted to the bar in 1866. He then became a member of the successful firm of Payne, Payne, and Clark, practicing at Auburn. He promptly entered politics as an ardent Republican. Between 1867 and 1879 he held, successively, the offices of city clerk of Auburn, supervisor, district attorney of Cayuga County, and president of the Auburn Board of education. With the exception of the Fifth Congress Payne served continuously in the House of Representatives from 1883 until his death. From 1899 until 1910 he was chairman of the Ways and Means Committee, and after 1900 he and Speaker Cannon were the most powerful Republican members and leaders. In party councils he had a wide influence, attending every national convention after 1892. In 1898 he was appointed by President McKinley a member of the Joint High Commission to negotiate a reciprocity treaty with Canada. His reputation as a statesman, however, was achieved in connection with tariff legislation. He was active and influential in the passage of the McKinley and Dingley tariff laws and was one of the framers of the so-called Payne-Aldrich Act of 1909. In politics Payne was, from conviction, a standpatter, a pronounced conservative, and an advocate of party regularity. He was accorded the unusual honor of a State funeral held in the House.

PAYNE, WILLIAM HAROLD (1836-1907). An American educator, born in Farmington, Ontario Co., N. Y. In 1858 he was appointed principal of a school in Three Rivers, Mich., and he held the same position in other schools of that State, concluding with Adrian, where he remained 10 years, and was then elected to the newly created chair of pedagogy in the University of Michigan (1879). He was chancellor of the University of Nashville, Tenn., and president of the Peabody Normal College from 1888 until 1901, when he returned to the University of Michigan, serving as head of the department of education till his death. He wrote: *Chapters on School Supervision* (1875; new ed., 1903); *Educational Doctrine* (1882); *Contributions to the Science of Education* (1887); *The Education of Teachers* (1901); and translated three of Compayré's works: *History of Pedagogy* (1886); *Lectures on Teaching* (1888); *Elements of Psychology* (1890).

PAYNE, WILLIAM MORTON (1858-). An American critic and educator, born at Newburyport, Mass. He was assistant librarian of the Chicago Public Library (1874-76), teacher in Chicago high schools after 1876, literary editor of the *Chicago Morning News* (1884-88), of the *Chicago Evening Journal* (1888-92), and associate editor of the *Dial*. At various times he lectured on English literature at the universities of Wisconsin, Kansas, and Chicago. Payne was honored with membership in the National Institute of Arts and Letters. His writings, besides critical articles in the field of modern literature, include: *The New Education* (1884), *Little Leaders* (1895), *Various Views* (1902); *The Greater English Poets of the Nineteenth Century* (1907); *Leading*

American Essayists (1909); *Björnstjerne Björnson* (1910). He translated Björnson's *Segurd Slembe* (1888) and Jaeger's *Ilsen* (1890) and edited *English in American Universities* (1895); *American Literary Criticism* (1904); *Select Poems of Swinburne* (1905); Swinburne's *Mary Stuart* (1906).

PAYNE SMITH, ROBERT (1819-95). An English theologian and Orientalist. He was born at Chipping Campden, Gloucestershire, and entered Pembroke College, Oxford, where he pursued Oriental studies and took the Sanskrit scholarship in 1840 and a Hebrew scholarship in 1843. After his ordination he spent three years in pastoral work at Crendon, Long Winchenden, and Thame, then became classical master at the Edinburgh Academy and later preached also at Trinity Chapel. In 1853 he went to London as head master of the Kensington proprietary school and pursued his favorite Oriental studies at the British Museum. In 1857 he became sublibrarian at the Bodleian Library, and here he began his great work, the *Thesaurus Syriacus*, the first part of which was published in 1868. From 1865 to 1870 he was regius professor of divinity at Oxford, and in 1869 he delivered the Bampton lectures, published as *Prophecy a Preparation for Christ* (1869). In 1870 he became dean of Canterbury. His position in the Church was one of sympathy with the evangelicals and his popularity extended widely, even in the Nonconformist bodies. For 15 years he was a member of the Old Testament revision committee. Besides the Syriac lexicon and the Bampton lectures he published: *S. Cyrilli Alexandriae Archiepiscopi Commentarii in Lucæ Evangelium Quæ Supersunt Syriace* (1858); *St. Cyril's Commentary on St. Luke's Gospel* (1859), in English; *The Third Part of the Ecclesiastical History of John, Bishop of Ephesus, now First Translated from the Original Syriac* (1860); *Catalogi Codicum Manuscriptorum Bibliothecæ Bodleianæ Pars Sexta, Codices Syriacos, Carshumcos, Mendæos Completens*, and commentaries on Daniel, Jeremiah, Samuel, and Genesis. His great learning has not preserved his biblical work from becoming antiquated. His memoir appeared with his *Sermons on the Pentateuch* (1896).

PAYNTER, WILLIAM. See PAINTER, WILLIAM.

PAYSANDÚ, pi'sán-doo'. A port of Uruguay, situated on the Uruguay River, 170 miles north of Buenos Aires (Map: Paraguay, H 4). The city has handsome public buildings, a good system of public schools, a library, and several scientific and benevolent societies. It is the centre of a rich agricultural and pastoral district. Its principal industry is the preservation of beef for the foreign market, especially ox tongues, to a brand of which it gives its name. It has regular communication by steamer with Buenos Aires and Montevideo. The city ranks next to Montevideo in size and commercial importance. Pop. (est.), 22,000. Paysandú was founded in 1782.

PAYSANS, pá'zán', LES (Fr., The Peasants). A gloomy tale by Balzac (1844), of which only the first part appeared before his death.

PAYSON, EDWARD (1783-1827). An American Congregational minister. He was born at Rindge, N. H., graduated at Harvard College in 1803, studied theology with his father, the Rev. Seth Payson, pastor at Rindge, and from 1807 till his death was pastor of the Congrega-

tional church at Portland, Me. His sermons, published at various times, were much read and gave him a wide reputation. His complete works were published with a memoir by Asa Cummings (3 vols., Philadelphia, 1846; 2d ed., 1859).

PAYTA. See **PAITA**

PAZ, pñth, ENRÍQUEZ DE. A Spanish dramatist, commonly called Enríquez Gómez (q.v.).

PAZ, pñs, LA. The name of several places in Spanish America. See **LA PAZ**

PAZAND, pñ'zánd, or **PAZEND**, pñ'zënd. See **PAHLAVI LANGUAGE AND LITERATURE**.

PAZARJIK. See **TATAR BAZARJIK**.

PÁZMÁNY, pñz'mä-ny', **PETER** (1570-1637). A Hungarian cardinal and author. He was born at Grosswarden of Protestant parents, but went over to the Roman Catholic church in 1583 and entered the Society of Jesus in 1587. He was an ardent Catholic and carried on almost single-handed the work of the Counter Reformation in Hungary. He became provost of Turóc, Bishop of Nyitra, Archbishop of Esztergom, and in 1629 Urban VIII made him Cardinal Primate of Hungary. For Catholic education in Hungary he did much by the foundation of the Pazmaneum (1623), a seminary for Hungarians in Vienna, and of several other schools. His published works were edited by Bognár (Budapest, 1894 et seq.). Consult Schwicker, *Peter Pázmány* (Cologne, 1888).

PAZ SOLDÁN, pñs sól-dán', **MARIANO FELIPE** (1821-86). A Peruvian historian and geographer. He was born in Arequipa, studied law there and at Lima, and practiced in both cities. He held high judicial offices in Lima and was sent to the United States in 1853 to report on penal systems. This mission resulted in the foundation of a detective bureau in Peru and of great improvements in the prisons of the country. He was Minister of Foreign Relations under President Castilla and of Justice in the term of Balta and later held the post of director of public works. He wrote *Atlas geográfico del Perú* (1861), *Historia del Perú independiente* (1866), *Diccionario geográfico estadístico del Perú* (1877); *Historia de la guerra del Pacífico* (1884).

PEA (mod. sing. of *peasc*, AS. *pise*, *piose*, *pea*, from Lat. *pisum*, Gk. *πίσος*, *pisos*, *πίσος*, *pson*, *pea*), *Pisum*. A genus of plants of the family Leguminosæ. The common pea or garden pea (*Pisum sativum*) and the field pea (*Pisum arvense*) are natives of the south of Europe and of Asia. They are both climbing annuals, with pinnate leaves, ovate leaflets, and branching tendrils in place of a terminal leaflet. Peas have been cultivated in the East from time immemorial, and were apparently introduced into Europe very early in the Middle Ages. Their cultivation extends from warm climates, as India, to the cooler regions of the North. The seeds of the garden pea are used for culinary purposes both in a green and in a ripe state. There are two main types of garden peas, those having smooth round seeds and those with wrinkled seeds. The former are the earlier and harder. The wrinkled varieties are better in quality. Some varieties have edible pods. The green succulent pods of these are eaten in much the same manner as green beans. These are grown to a considerable extent in Europe and offered by seedsmen in America, but are not popular. There are innumerable varieties both of the field pea and of the garden pea. Some of

the latter have long stems and require for their support stakes of 6 or 8 feet in height; others are of humbler growth; and certain dwarf kinds, preferred as most convenient in many gardens, succeed very well without stakes. The largest kinds are sown in rows about 4 feet apart. A calcareous soil is desirable, but good crops are secured on almost any good wheat or maize soil. Peas are cultivated to a considerable extent as a field crop in the northern United States and Canada, and both the grain and straw are used in feeding stock. The plant withstands light frosts, and may therefore be grown as early in spring as the ground can be worked. Semidwarf varieties are preferred for field culture, since they lodge less and the crop is more easily harvested.

The other species of *Pisum* are few. But the name pea is often given to species of other papilionaceous genera. A plant found on some parts of the shores of Great Britain, as well as of continental Europe and North America, known as the sea or beach pea, has been commonly referred to the genus *Pisum*, but is now called *Lathyrus maritima*. It much resembles the common pea, has large reddish or purple flowers on many-flowered stalks, and its seeds have a disagreeable bitter taste. The sweet pea (q.v.) and everlasting pea are also species of *Lathyrus*. The chick-pea (q.v.) is a species of *Cicer*. The cowpea is *Vigna sinensis*.

Food and Feeding Value. Both green and dried peas are much used as articles of diet. The shelled green pea has the following average percentage composition: water, 74.6, protein, 7, fat, 0.5; total carbohydrates, 16.9, and ash, 1.0. Dried peas have the following percentage composition: water, 9.5; protein, 24.6, fat, 1; total carbohydrates, 62, and ash, 2.9. Dried peas are used for soups and purées, cooked in other ways, and sometimes baked like beans. They are rich in protein, and, being readily digested if cooked soft, are a valuable food. As food, green peas are especially prized for their delicate flavor, which is retained when they are properly canned. The varieties with edible pods (pods and seeds) have the following percentage composition: water, 81.8, protein, 3.4; fat, 0.4, total carbohydrates, 13.7, ash, 0.7. Pea meal is too sodden to be fed alone, and should always be mixed with bran, ground oats, or corn meal. Pea vines have the following percentage composition: water, 15, protein, 13.7, fat, 2.3, nitrogen-free extract, 37.6, crude fibre, 24.7, and ash, 6.7. In northern regions peas, especially when ground, replace corn to some extent, and, on account of the large amount of protein they contain, have a high feeding value. See **PEA INSECTS**. See **PLATES OF FLOWERS, LEGUMES**.

PEA'BODY. A town, including several villages, in Essex Co., Mass., 2 miles west of Salem, on the Boston and Maine Railroad (Map. Massachusetts, F 2). It has the Peabody Institute, with a library of 38,000 volumes, established in 1852 by George Peabody, and the Eben Dale Sutton Reference Library. There are a public park (Emerson), the J. B. Thomas Hospital, a fine high school, and a parochial school and convent. The town is a manufacturing centre of considerable importance, its products including leather, morocco, shoes, gloves, leather-working machinery, electrical supplies, marine hardware, candy, cotton goods, soap, glue, etc. The government is administered by town meetings. There are municipal water works and a muni-

cial electric-light plant. First a part of Salem and then of Danvers, Peabody became a separate town under the name of South Danvers in 1855. In 1868 its present name was adopted in honor of George Peabody, who was born here and lived here for some years. Pop., 1900, 11,523; 1910, 15,721; 1915 (state census), 18,522.

PEABODY, ANDREW PRESTON (1811-93). An American Unitarian clergyman. He was born at Beverly, Mass., and graduated in 1826 at Harvard College, where, after studying at Harvard Divinity School, he was tutor in mathematics. From 1833 to 1860 he was minister of a Unitarian church in Portsmouth, N. H., and then was Plummer professor of Christian morals and chaplain of Harvard till 1881. He edited the *North American Review* (1852-61). Among his numerous works are *Lectures on Christian Doctrine* (1844); *Reminiscences of European Travel* (1868); *Manual of Moral Philosophy* (1873); *Christianity and Science* (1874, new ed., 1890); *Christian Belief and Life* (1875); *Moral Philosophy* (1887); *Harvard Reminiscences* (1888); *Harvard Graduates Whom I Have Known* (1890); *Masterpieces of Cicero* (new ed., Boston, 1912). Consult the memorial sermon by James De Normandie (Boston, 1893).

PEABODY, CECIL HOBART (1855-). An American mechanical engineer, born at Burlington, Vt. He graduated in 1877 at Massachusetts Institute of Technology, where in 1883 he became assistant professor of steam engineering and in 1893 professor of marine engineering and naval architecture. Between graduation and his return to Boston he had been professor of mathematics in the Sapporo Imperial Agricultural College of Japan and assistant professor of mechanical engineering in the University of Illinois. His publications include *Tables of the Properties of Saturated Steam and Other Vapors* (1888, 8th ed., 1909); *Thermodynamics of the Steam Engine* (1889, 6th ed., 1910); *Valve Gear for Steam Engines* (1892); *Steam Boilers*, with E. F. Miller (1897; 3d ed., 1912); *The Steam Engine Indicator* (1900); *Naval Architecture* (1904, 3d ed., 1911); *Propellers* (1912); *Computations for Marine Engines* (1913).

PEABODY, ELIZABETH PALMER (1804-94). An American educator, born at Billerica, Mass. She was for a time connected with the school of Amos Bronson Alcott, in Boston, of which she wrote an account entitled *A Record of Mr. Alcott's School* (3d ed., 1874); but later she came under the influence of Friedrich Fröbel (q.v.) and was one of the most active in introducing the kindergarten system into the United States. She published a number of works, including: *Crimes of the House of Austria* (1852); *Kindergarten Culture* (1870); *Kindergarten in Italy* (1872); *Reminiscences of Dr. Channing* (1880); *Letters to Kindergartners* (1886).

PEABODY, EPHRAIM (1807-56). An American Unitarian clergyman. Born at Wilton, N. H., he graduated at Bowdoin College in 1827 and at Harvard Divinity School in 1830, served as pastor of a Unitarian church in New Bedford (1838-46), and thereafter until his death occupied the pulpit of King's Chapel, Boston. He was the founder of the Boston Provident Society. His sermons, with a memoir, appeared in Boston in 1857 and in 1858 a selection from his writings entitled *Christian Days and Thoughts*.

PEABODY, FRANCIS GREENWOOD (1847-). An American Unitarian clergyman and author, born in Boston. He graduated from Harvard in 1869 and from the Harvard Divinity School three years later, was pastor of the First Parish Church in Cambridge, Mass., from 1874 until 1881, when he became Parkman professor of theology at Harvard. Five years afterward he was transferred to the Plummer professorship of Christian morals. Dr. Peabody was acting dean of the Divinity School in 1885-86 and 1893-94, and dean in 1901-05. His publications include: *Short Addresses to Young Men on Personal Religion* (1896); *Afternoons in the College Chapel* (1898); *Jesus Christ and the Social Question* (1900), a book of much influence; *Religion of an Educated Man* (1903); *Jesus Christ and the Christian Character* (1905); *Mornings in the College Chapel* (1907); *The Approach to the Social Question* (1909); *Sunday Evenings in the College Chapel* (1911); *The Christian Life in the Modern World* (1914). For his father and brother, see **PEABODY, EPHRAIM**, and **ROBERT SWAIN**.

PEABODY, GEORGE (1795-1869). An American merchant and philanthropist, born Feb. 18, 1795, in that part of Danvers, Mass., now known as Peabody. When about 16 years old he went to Georgetown, D. C., where within two years he entered the employ of Elsha Riggs, a wholesale dry goods merchant. Twice during the War of 1812 he had been a volunteer. The firm removed to Baltimore in 1815 and afterward established branches in New York and Philadelphia. Peabody, who, after a rapid rise, became head of the firm in 1829, continued to reside in Baltimore during the next few years. In 1835, as one of three commissioners of the State of Maryland, he negotiated in London a loan of \$8,000,000 and declined to receive the large commission to which he was entitled. Later (retaining a branch in Baltimore) he founded the house of George Peabody & Co. in London and there he remained until his death. During his long absence from the United States he maintained the liveliest interest in his native land. This was shown by a liberal gift to promote the American exhibit in the World's Fair of 1851, by a contribution for the second Kane expedition to the Arctic seas, and by a series of banquets on Independence Day, which were attended not only by his countrymen but by Englishmen of official rank and otherwise distinguished. During the later years of his life his gifts increased in amount and were devoted to a great variety of purposes. To his native village he gave about \$200,000 to found the Peabody Institute and Library and to the northern part of the town of Danvers \$100,000 for a like institution; to the publication funds of the Massachusetts Historical Society and the Maryland Historical Society \$20,000 each, to the Peabody Academy of Science in Salem, Mass., \$140,000, to Harvard and Yale \$150,000 each, for the establishment, respectively, of a museum of archaeology and a museum of natural history. Phillips Academy at Andover and Kenyon College in Ohio received \$25,000 each. During the Civil War Peabody gave \$10,000 to the United States Sanitary Commission. Three other gifts transcended those already named. As a token of affection for the city of Baltimore, where he laid the foundation of his fortune, he devoted more than \$1,250,000 to the establishment of

the Peabody Institute, which comprises a library, an art gallery, a conservatory of music, and arrangements for the delivery of public lectures and for the bestowal of prizes in the public schools. To the city of London he gave \$2,500,000 for the construction of lodging houses—a fund which has since increased enormously. A separate board, known as the Trustees of the Peabody Education Fund (q.v.; see also **PEABODY COLLEGE FOR TEACHERS**), received more than \$3,000,000 to promote education in the Southern States. This was perhaps the most influential of all his gifts. Such munificence as he had displayed, then without parallel, brought him gratitude and honor from England and the United States. The Queen offered to make him Baronet or to give him the Grand Cross of the Bath, but he declined both honors and expressed a preference for a token to send to his native town. The Queen had a miniature portrait of herself painted and framed in gold. This, together with a gold box containing evidence that Mr. Peabody had been given the freedom of London, was placed in the Institute at South Danvers (now Peabody). Congress caused a gold medal to be struck in acknowledgment of his gifts for education, which had aggregated about \$7,000,000. Oxford made him a D.C.L. in 1867.

George Peabody was never married. His death occurred in London, Nov. 4, 1869. His body was brought to the United States by H.M.S. *Monarch*, convoyed by a French and an American vessel and received by an American squadron. Many eulogies were delivered, of which the most important were those of Robert C. Winthrop (Boston, 1870), S. T. Wallis (Baltimore, 1870), Edward Everett (*Orations*, vol. iii, Boston, 1869), and H. W. Foote (ib., 1869). Consult also the biography by Phoebe A. Hanaford (Boston, 1870) and the *Brief Sketch* by J. L. M. Curry (Cambridge, 1898). A bronze statue of Peabody, by William W. Story, stands near the Royal Exchange in London and a replica of it in front of the Peabody Institute in Baltimore.

PEABODY, GEORGE FOSTER (1852-). An American capitalist and promoter of education, especially in the south. He was born at Columbus, Ga. As president, vice president, or director, he became connected with various realty and mining companies. From 1896 to 1905 he was treasurer of the Democratic National Committee. Retiring from active business in 1906, he devoted his time to educational work. Peabody became director of the General Education Board, treasurer of the Southern Education Board, and trustee of the American Church Institute for Negroes, of Hampton and Tuskegee institutes, of the University of Georgia, Colorado College, and the Brooklyn Polytechnic Institute. He received honorary degrees from Harvard, Washington and Lee, and Georgia universities.

PEABODY, JOSEPHINE PRESTON (?-). An American poet and dramatist, born in New York and educated at the Girls' Latin School, Boston, and at Radcliffe College. From 1901 to 1903 she was instructor in English at Wellesley. In 1906 she married Prof. L. S. Marks of Harvard University. The Stratford-on-Avon prize went to her in 1909 for her drama *The Piper*, which was produced in England in 1910; in America at the New Theatre, New York, in 1911. Her other work comprises *The*

Wayfarers: A Book of Verse (1898); *Fortune and Men's Eyes: New Poems, with a Play* (1900); *Marlowe* (1901), a drama; *The Singing Leaves* (1903); *The Wings* (1905), a drama; *The Book of the Little Past* (1908); *The Singing Man* (1911), poems; *The Wolf of Gubbio* (1913), a drama; *New Poems* (1915).

PEABODY, ROBERT SWAIN (1845-). An American architect, and brother of Francis Greenwood Peabody. Born at New Bedford, Mass., he graduated in 1866 from Harvard (A.M., 1870) and studied also at the Ecole des Beaux-Arts, Paris, in 1868. After 1870 he practiced in Boston and after 1909 was chairman of the Boston Park Commission. Peabody designed, among other notable buildings, the Providence Railroad station (since demolished) and Chamber of Commerce, in Boston, the City Hall, Worcester, Mass., Machinery Hall at the Chicago World's Fair (1893), and the Chamber of Commerce, Cleveland, Ohio. He served as an overseer of Harvard in 1888-89 and again after 1907, was president of the American Institute of Architects (1900-01) and of the Boston Society of Architects (1902-05, 1907-09), and became a member of the National Institute of Arts and Letters and associate of the National Academy of Design in 1910. His publications include *A Holiday Study of Cities and Ports* (1908) and *An Architect's Sketch Book* (1912).

PEABODY, SELIM HOBART (1829-1903). An American educator, born at Rockingham, Vt. He graduated at the University of Vermont in 1852, during the following years held professorships of mathematics, physics, and engineering at several colleges, and from 1880 to 1891 was president of the University of Illinois. In 1893 he was chief of the department of liberal arts at the World's Columbian Exposition, in 1899-1900 editor and statistician of the United States Commission to the Paris Exposition, and in 1900 superintendent of the division of liberal arts at the Pan-American Exposition. From 1892 to 1895 he served as president of the Chicago Academy of Sciences and from 1889 to 1891 as president of the National Council of Education. Peabody was editor in chief and later associate editor of the *International Cyclopaedia*. His publications include: *Astronomy* (1869); *Juvenile Natural History* (3 vols., 1869); *New Practical Arithmetic*. (1872); *American Patriotism* (1880); *Charts of Arithmetic* (1900).

PEABODY BIRD (named from the Peabody Glen in the White Mountains). A local name in New England for the white-throated sparrow (*Zonotrichia albicollis*). It is one of the largest and handsomest sparrows of North America, second in size only to the fox-colored sparrow, from which it differs markedly in color. The peabody bird is variegated brown, black, and white above, clear gray beneath, with a pure white throat and prominent black, white, and yellow stripes on the head. It breeds from northern Michigan and New England northward to Labrador, and winters from New England to Florida. It is most remarkable for its very agreeable, though brief, song, consisting of two low soft notes followed by a thrice-repeated triple note clearly whistled. In Massachusetts it is usually interpreted as I—I, *Pea-bod-y, Pea-bod-y, Pea-bod-y*; in Maine, *All day, whit-tle-ing, whit-tle-ing, whit-tle-ing*; in Canada, *Sweet Can-a-da, Can-a-da, Can-a-da*.

PEABODY COLLEGE FOR TEACHERS, more properly **GEORGE PEABODY COLLEGE FOR TEACHERS**. An institution for the higher education of teachers, organized in 1910 at Nashville, Tenn. The college is the lineal successor of the Peabody Normal College, founded in 1875 as the Peabody Normal School of the South by the trustees of the Peabody Education Fund (q.v.) Normal College was in existence from 1875 to 1911 and was maintained in connection with the University of Nashville and supported by annual appropriations from the Peabody Fund. In 1909, after many years of effort on the part of the alumni of the Normal College and friends of education in the South, the trustees of the Peabody Fund completed plans for the permanent endowment of an all-southern teachers' college by assembling donations amounting to nearly \$1,750,000, of which \$1,000,000 was from the Peabody Fund, \$250,000 from the State of Tennessee, and the remainder from the city of Nashville, Davidson County, and the University of Nashville, which gave grounds and buildings estimated in value at \$250,000. In 1911 the trustees of the newly organized college elected as president Dr. Bruce R. Payne, and an effort was at once begun for increasing funds. These were raised to \$3,250,000 by Jan 1, 1915. In addition to this sum the alumni association pledged \$250,000. A new site adjoining the Vanderbilt property was purchased. The campus comprises over 50 acres of wooded lawns. In September, 1915, four new buildings had been completed at a cost of \$750,000. The final plan contemplates 18 academic buildings, 15 residence halls, demonstration and practice schools, a social-religious service building, and an eight-acre athletic field and playground. The college opened its doors on June 26, 1914, for summer school. In this there were enrolled 1108 students. There were 200 different courses offered. In 1914-15 the enrollment of students was 275, while the faculty numbered 29.

PEABODY EDUCATION FUND. A fund founded in 1867 by George Peabody (q.v.) for the purpose of promoting "intellectual, moral, and industrial education in the most destitute portion of the Southern States." The gift of foundation consisted of securities to the value of \$2,100,000, of which \$1,100,000 were in Mississippi State bonds, afterward repudiated. In 1869 an additional \$1,000,000 was given by Mr Peabody, with \$384,000 of Florida bonds, also repudiated later. The trustees, chosen from the most prominent public men in the United States, had authority to expend 40 per cent of the principal during the first two years, after which the amount was to remain unchanged for 30 years, when the fund might be used and distributed for educational purposes. The main purpose of the fund was to aid elementary education, and that by strengthening existing schools rather than by founding new ones. Only schools having an attendance of more than 100 and a school period of 10 months were to be aided. To such schools \$300 was to be given, to those having an attendance of 200, \$600 was given; and to those having an attendance of 300, \$1000 was given. All grants were made on condition that the district contributed twice as much as the Peabody Board, and in all cases the board worked in unison with State and local school authorities. Especial attention was given to the support of normal schools, particularly those on

independent foundations. Scholarships of \$200 in value, later of \$100 and traveling expenses, were granted to numerous students. In 1875 the Peabody Normal School, later Peabody Normal College, was established at Nashville, Tenn. The annual distribution of the products of the funds averages about \$80,000 per year, and in the 30 years of the fund terminating in 1898 a total of more than \$2,500,000 was distributed. In 1903 it was decided to change the Normal College into an institution for the higher professional training of teachers. (See **PEABODY COLLEGE FOR TEACHERS**.) With the opening of the college the work of the fund, mainly to raise the standard of education in the South, was realized to be at an end and its affairs were wound up. Consult L. P. Ayres, *Seven Great Foundations* (New York, 1911).

PEACE (OF. *paix*, *paiz*, Fr. *paix*, from Lat. *pax*, peace; connected with *pangere*, Gk. *πηνύειν*, *pégnynai*, to fasten, Skt. *pāśa*, bond, and perhaps with Goth., OHG. *fāhan*, AS *fōn*, Ger *fangen*, to seize, take). In law, in a general sense, the internal good order of a community that is violated by the commission of offenses against the law. This general sense is expressed in England by the phrase the "King's peace" and in the United States by that of the "peace of the State or Commonwealth" or of the "public peace." Originally the expression "the King's peace" was used in a narrower sense, with reference to the sanctity of the King's house, or to the special protection of the King's servants, or of those to whom he had accorded the same protection.

Offenses against the public peace are criminal offenses, known as breaches of the peace, the wrongfulness of which consists either in an act by the offender which is an actual disturbance of public peace and order, as in the case of riot or affray, or an act which is a constructive rather than an actual disturbance of the peace in that it has a tendency to cause public disturbance or disorder, as unlawful assembly or seditious libel.

The more common forms of offenses against the peace are riot, affray, forcible entry and detainer, unlawful assembly, challenge to fight, and seditious libel. In addition to these well-defined offenses there are other offenses against the peace, having no specific name, which are punishable as misdemeanors. Thus, in some States the malicious killing of another's horse and the causing of a disturbance in the home of another have been held to be offenses against the peace.

Forcible entry and detainer is strictly not an offense at common law. It was made so, however, by an early English statute, and is now regarded as a common-law offense.

Seditious libel is an offense against the peace as tending directly to a breach of the peace by giving affront to public opinion, as by libels vilifying officers of the government, the courts of justice, or even the sovereign or chief officers of a foreign government. Ordinary libels are also for the same reason sometimes classified as offenses against the public peace. Consult Sir J. F. Stephen, *History of the Criminal Law of England* (3 vols, London, 1883); Sir William Blackstone, *Commentaries on the Laws of England* (4th ed., 2 vols., Chicago, 1899); Pollock and Maitland, *History of English Law* (2d ed., 2 vols., Cambridge, 1903); also references under **CONSTABLE**; **CRIMINAL LAW**. See **AFFRAY**;

BREACH OF THE PEACE; FORCIBLE ENTRY AND DETAINER; JUSTICE OF THE PEACE.

PEACE, BILL OF. See **EQUITY.**

PEACE CONFERENCE. See **PEACE MOVEMENT.**

PEACE CONVENTION. The name given to a convention held in Washington, on the invitation of Virginia, in February, 1861, just before the outbreak of the Civil War, for the purpose of arranging a peaceful settlement of the difficulties between the North and the South. Fourteen free States and seven slave States were represented and each State was allowed only a single vote. Ex-President Tyler presided over the convention. A committee, upon which each of the 21 States was represented, submitted a report, which was adopted, recommending the adoption of certain specified amendments to the Federal Constitution. These amendments generally favored the South, but were not wholly satisfactory to either section, and were not favorably received by either House of Congress.

PEACE MOVEMENT. While traces of the peace movement, or pacifism, are to be found in classical literature and are extremely numerous in the writings of the Church fathers, the origins of the modern movement do not date beyond the fifteenth century. In 1462 Georg von Podiebrad, King of Bohemia, advanced a plan for a federation of Christian nations, with an international parliament to discuss matters of common interest and a tribunal, backed by an international military force, to hear and determine all disputes between nations. A similar plan was proposed by Henry IV of France about the end of the sixteenth century. Schemes of world organization designed to assure permanent peace were launched in considerable numbers in the seventeenth century. Of these the most noteworthy were that of Emeric de Lacroix (1623), which proposed a permanent congress of nations sitting at Venice and urged universal free trade as a means of creating international harmony; that of Grotius (*De Jure Belli et Pacis*, 1625), including an international congress and an arbitration tribunal, as well as an attempt to regulate and humanize war itself; and that of William Penn (*An Essay on the Present and Future Peace of Europe*, 1693), which proposed a representative congress of states, meeting annually or biennially, an arbitration tribunal, and the obligation upon all states in the federation to join in the coercion of any which should refuse to submit disputes to arbitration or should fail to accept the awards of the tribunal.

In 1712-16 the Abbé St. Pierre published a bulky work entitled *Projet de la paix perpétuelle*, which exerted a notable influence upon thought in this field for over a century. As in the earlier projects, the plan of a permanent congress of European states and an arbitration tribunal appears in the project of the Abbé St. Pierre. In addition new administrative organs of politics, finance, military affairs, and law are proposed; conciliation is urged, leaving arbitration as a last resort; and the first definite proposal of disarmament is made. Each state, by this plan, would limit its standing army to 6000 men. In case force were required to subject an unwilling member to the award of the arbitration tribunal, the cost was to be distributed among the states in proportion to their revenues.

Among eighteenth-century adherents of the

scheme of a congress of nations with a tribunal competent to settle all disputes between states were Leibnitz, Turgot, and many of the Encyclopædists. Pacifism was widely prevalent among the intellectual leaders of France in the third quarter of the eighteenth century. In Germany it had fewer adherents. Frederick the Great looked with great scorn upon the ideas of the Abbé St. Pierre, and rejected, as smacking of that system, the proposal of the Austrian Chancellor von Kaunitz for a reduction in the armies of the two states to one-fourth of their footing at the close of the Seven Years' War. In England the ideal of international organization found scientific expression in the work of Jeremy Bentham, *Principles of International Law* (1786-89). Bentham proposed an international congress and arbitration tribunal with an armed force to execute its decrees. The novelty of his work consists mainly in the stress upon measures for avoiding international disputes. To this end he demanded the codification and extension of international law, limitation of armaments by treaty, equal treatment for all nations in commerce, and liberalization of colonial policy. An important contribution to the ideas of the peace movement was made by Immanuel Kant, who emphasized the desirability of leaving decisions of peace and war to the people (1793) and of basing international law upon a federation of free states. The menace of standing armies and competitive armaments was pointed out by Kant, as well as the menace of increasing war debts. Ideas of peace, in reaction from the miseries of the French wars, gained a wide following in the early part of the nineteenth century and played a considerable part in the formation of the Holy Alliance (1815), later diverted into an agency of reaction against the popular movement in Europe.

The first half of the nineteenth century contributed no new ideas to the peace movement, but laid the basis for its popularization through the formation of permanent peace societies, national and international. The first peace society in the world was organized in New York in 1815 by David Low Dodge. In the same year the Massachusetts Peace Society was organized by Noah Worcester, and under the auspices of this society was published the *Friend of Peace*, the first periodical devoted to the cause of peace. The organization of peace societies in America proceeded rapidly and by 1826 there were about 50 in existence. In 1828 the American Peace Society was organized in New York by William Ladd. In 1834 the headquarters of the society were removed to Hartford, in 1834 to Boston, in 1911 to Washington.

A peace society was organized in London by William Allen and Joseph Price in 1816. The first peace society on the European continent was organized at Geneva in 1830. Informal relations of sympathy early obtained between the several national peace societies, and in 1843 an international peace congress was held in London, with 294 British delegates, 37 American, and 6 from the continent of Europe. The practical programme of the peace societies of the period, originally advanced by the American Peace Society, was the organization of a congress of nations, meeting periodically, and a permanent arbitration tribunal with power to settle all disputes between nations. Enforcement of the decrees of the tribunal was to be left to international public opinion. In 1847 Elihu Burritt,

one of the most active leaders of the movement in America, went to Europe to carry on an agitation for the organization of a congress and a court of nations. At an international peace congress at Brussels, held in 1848, Burritt secured the adoption of resolutions looking to this end. In 1849 an international peace congress was held at Brussels under the presidency of Victor Hugo. Among the distinguished delegates were Cobden, Thierry, Girardin, and Bastiat. The congress adopted resolutions urging limitation of armaments and the placing of a ban upon foreign loans for war purposes. Through the next decade several congresses were held, without the development of anything new in principle or method. Of some importance was the introduction of the peace movement in legislative bodies. In 1832 the Massachusetts Senate adopted a resolution in favor of arbitration. In 1837 a petition of the same character was submitted to Congress. A resolution in favor of international arbitration was adopted by the United States Senate in 1853 and submitted to the President. In 1849 Cobden introduced in the British Parliament a resolution favoring arbitration treaties with all nations, which was defeated by a vote of 176 to 97. The peace agitation of the period has been credited with a certain influence in determining the attitude of the Paris Conference of 1856 towards friendly mediation in international disputes. Otherwise its influence was mainly educative. It commanded the support of many of the most distinguished statesmen of the time—Cobden, Peel, Disraeli, Garibaldi—and even Napoleon III sought to take the initiative in calling a European congress to consider means of preserving peace and limiting the burden of armaments. Prussia proved averse to the plan; hence nothing came of it.

A new factor in the movement was the agitation for the humanization of war, led by Henri Dunant. This agitation led in 1864 to the Geneva Convention (q.v.), at which 16 governments were represented. The convention adopted by the conference later received the adhesion of practically all civilized nations and has served to mitigate in some measure the hardships endured by the wounded and captured. See RED CROSS.

The international peace movement suffered a severe check from the wars of the third quarter of the nineteenth century. The Crimean War disorganized the British movement, the Civil War disrupted the American movement, and the Franco-Prussian War gave a serious setback to French pacifism. A number of societies of considerable importance were, however, organized during the period, such as the League of Peace and Liberty, organized in 1867 by Lemonnier, Victor Hugo, and Garibaldi, the Peace League of the Netherlands (1870), and the Belgian Union of the Friends of Peace, organized under the presidency of Emile de Laveleye. Most significant was the organization in 1873 of the Institut de Droit International, at the initiative of the Belgian jurist, G. Rolin-Jacquemins. The most distinguished jurists of Europe were in attendance, and their work influenced the later development of the peace movement in a marked degree. In 1887 a delegation of British members of Parliament, under the leadership of Randal Cremer, visited America to lay before President Cleveland a document signed by 232 members of Parliament in favor of a British-

American arbitration treaty. In 1888 the supporters of arbitration in the British Parliament met in Paris with the supporters of arbitration in the French Chamber and formed the organization now known as the Interparliamentary Union. This organization rapidly increased through the accession of members of parliamentary bodies of most of the Western nations. In 1913 it had about 3600 members from 22 states, representing over one-third of the aggregate membership in the parliaments represented. An American group of the Interparliamentary Union was organized in 1904 and quickly assumed leadership in the movement for arbitration treaties in America. The Pan-American movement, inaugurated by Blaine's proposal for a Pan-American congress in 1881 (though not realized until 1889), included among its objects the establishment of means for the peaceable settlement of international disputes on the Western continent.

In 1889 the first World's Peace Congress was held at Paris. From that year the international movement gained steadily in vigor. At the third World's Peace Congress, held at Bern in 1892, a permanent bureau, known as the International Peace Bureau, was created, to work towards the centralizing of the peace movement. In Germany and Austria a strong sentiment favorable to the peace movement was created by the publication in 1890 of Baroness von Suttner's book, *Die Waffen nieder*. In 1892 Dr. Alfred H. Fried founded the first German periodical devoted to peace, *Die Waffen nieder*.

After 1890 peace organizations multiplied throughout the world. New organizations were founded to advance the cause of arbitration treaties, to extend the scope of international law, to investigate the causes of international strife, and to propose means for their removal. The increasing burden of military preparations enlisted in the peace movement large numbers of men who had held aloof so long as the humanitarian aspects of the question were alone emphasized by peace advocates. An indication of this broadening of the base of the movement is given by the development of the Lake Mohonk Conferences on International Arbitration, held at Mohonk Lake, N. Y., annually since 1895. Originally attended chiefly by men who were already identified with the peace movement, the conferences gradually attracted an increasing number of delegates from business organizations (chambers of commerce, etc.) until in 1915 most of the important business organizations in the United States had accorded their support to the purposes of the conferences. A great impetus to the study of the financial and economic aspects of war and military preparations was given by the publication of J. de Bloch's monumental work on war, published in Russia in 1898 and translated into German the following year. Bloch's analysis of the probable results of a war between the modern Great Powers indicated the probability that conclusive results, if attainable, would be had at the cost of universal bankruptcy. Bloch's work excited lively discussion throughout Europe and induced the Czar of Russia to issue an invitation to the Powers to meet in conference at The Hague.

Another factor of increasing importance in the peace movement after 1890 was the anti-militarism of the Social Democratic and Labor parties of Europe. According to Socialist theory, all war not actually defensive is a heavy

incubus upon labor. Aggressive wars, especially when directed towards the acquisition of colonies, are capitalistic and their tendency is to keep labor in subjection. While the working class antimilitarism movement held aloof from the general or bourgeois peace movement, its existence offered a certain parliamentary support to practical proposals for limiting armaments and instituting arbitration treaties.

The First Peace Conference, called by invitation of the Czar of Russia, assembled at The Hague, May 18, 1899. One hundred delegates were in attendance, representing 21 European states, the United States and Mexico, China, Japan, Persia, and Siam. The conference adjourned on July 29, after adopting a final act including three conventions, three formal declarations, and six resolutions. The conventions related (1) to the pacific settlement of international disputes; (2) to the laws and usages of war on land; (3) to the adaptation of the rules of maritime warfare to the Geneva Convention (q.v.). The declarations related to (1) prohibition of the use of projectiles or explosives launched from balloons for a period of five years; (2) prohibition of the use of projectiles diffusing asphyxiating or deleterious gases; (3) prohibition of the use of dumdum bullets. The resolutions urged the desirability of limiting the burden of armaments, proposed that questions relating to the rights and duties of neutrals, inviolability of private property in maritime warfare, and the bombardment of towns, be referred to a later conference; that military budgets be limited, and that types and calibre of maritime artillery and small arms be studied by governments with a view to establishing uniformity. A Permanent Court of Arbitration, sitting at The Hague, was created. A permanent list of jurists eminent in international law, of whom each power might nominate four, constituted the personnel of the court; for particular arbitrations each party might choose two arbitrators either from the permanent list or from persons not members. Provision was also made for international commissions of inquiry, with investigative powers only, to examine into and report upon international disputes not affecting the national honor or vital interests. It was further agreed that in case of dispute between two signatory powers the offer of good offices by a third power was not to be considered an unfriendly act.

The initiative towards calling a second Hague Peace Conference was taken by the United States through a circular of the Secretary of State addressed to the Powers on Oct. 21, 1904. The conference was assembled upon the invitation of the Czar of Russia on June 15, 1907. Delegates were present representing 21 European states, 19 American, and 4 Asiatic. The conference adopted conventions looking to the pacific settlement of international disputes; to limitations upon the use of force for the collection of debts; to regulation of the law of prize and of the conduct of war on land and sea; and against the launching of explosives from air craft. Preliminary steps were taken for the summoning of a third Conference in 1915, a project repeatedly urged by peace organizations throughout the world until the outbreak of the European War in 1914.

The agitation for international peace was carried on with increasing energy by the various peace organizations after the opening of the

twentieth century, despite the setback given by the Boer and Russo-Japanese wars. Especial stress was laid upon the financial cost of war and armaments, and leading statesmen in all the chief countries accepted in principle the desirability of limiting armaments through international agreement. In England and America a strong popular movement against war, based essentially on economic grounds, was produced by the publication of Norman Angell's *Europe's Optical Illusion* (1909; later republished under the title *The Great Illusion*). The argument of this book, that the gains from aggressive warfare in a world of internationalized capital and credit are illusory, the costs overwhelming and shared by neutrals as well as belligerents, brought to the peace movement large numbers of persons who had remained apathetic to the traditional appeals of pacifism. The propaganda for peace was placed on a solid financial basis by the establishment in 1910 by Edwin Ginn of the World's Peace Foundation with an endowment of \$1,000,000 and the Carnegie Endowment for International Peace with an endowment of \$10,000,000. The purposes of the two endowments are identical; the World's Peace Foundation is, however, more strictly devoted to direct propaganda, while the Carnegie Endowment conducts research on the causes of war under the division of economics and history, seeks to stimulate the development of international law under a division of that name, and conducts propaganda, largely through the agency of existing societies, under the division of intercourse and education. Thus, the endowment lent its support to a reorganization of the American Peace Society, placing that society in the position of parent company to the various State and local organizations, which receive subsidies from the endowment only through the American Peace Society. A similar work of coordination is carried on by the endowment in foreign countries.

A natural result of the European War was relaxation of the peace propaganda in the belligerent countries. In England, however, a new organization made its appearance in 1914 under the name of the Union for Democratic Control, directed especially against the committing of nations to warlike policies through secret diplomacy. In the United States an organization appeared in 1915 under the name of the League of Peace, having for its object the formation of a league of nations bound by treaty to arbitrate all disputes arising among them and using joint military and naval forces to coerce recalcitrant members.

In the early history of the peace movement the prevailing view involved opposition to any and all wars. This view of international passivism, peace at any price, fails to command the adhesion of any considerable faction of the modern peace movement, although it is often erroneously held to constitute an article of the pacifist creed. The essential doctrine of modern pacifism is that war is always an evil—though not necessarily the greatest evil—to be avoided by whatever means may be available. The majority of pacifists are not advocates of the immediate disarmament of any nation, irrespective of the policy of its neighbors, though holding that exaggerated armaments lead to the creation of international suspicion that makes for war.

Bibliography. The most satisfactory account of the peace movement as a whole is given

by A. H. Fried, *Handbuch der Friedensbewegung* (Leipzig, 1911-13). This work contains a select bibliography especially satisfactory for European publications. For the early American movement, consult W. E. Channing, *Discourses on War* (Boston, 1839; new ed., 1903); J. A. Bolles and others, *Prize Essays on a Congress of Nations* (ib., 1840); William Jay, *War and Peace* (London, 1842); Charles Sumner, *The War System of the Commonwealth of Nations* (Boston, 1845). For the later development of the American movement, consult Julius Moritzen, *The Peace Movement in America* (New York, 1912). Since 1880 the literature of the movement has become extremely voluminous, but the following list includes the most useful recent works accessible in English: Sheldon Amos, *Political and Legal Remedies for War* (New York, 1880); Baroness von Suttner, *Lay down your Arms* (ib., 1894; 2d ed., 1906); W. T. Stead, *The United States of Europe* (ib., 1899); Michael Anitchkow, *War and Labor* (London, 1900); Guglielmo Ferrero, *Militarism* (ib., 1902); J. S. Bloch, *The Future of War in its Technical, Economic and Political Relations*, English translation by R. C. Long (Boston, 1903); Sir Thomas Barclay, *Problems of International Practice and Diplomacy* (ib., 1907); A. T. Mahan, *Some Neglected Aspects of War* (ib., 1907); D. S. Jordan, *The Human Harvest* (ib., 1907); B. F. Trueblood, *The Federation of the World* (3d ed., ib., 1908); Jacques Novikov, *War and its Alleged Benefits* (New York, 1911); H. M. Chittenden, *War and Peace* (Chicago, 1911); L. T. A. Mead, *Swords and Ploughshares* (New York, 1912); W. I. Hull, *The New Peace Movement* (Boston, 1912); C. W. Eliot, *The Road toward Peace* (Boston, 1915); F. F. P. Andrews, *The Promotion of Peace* (ib., 1913); R. N. A. Lane (Norman Angell, pseud.), *The Great Illusion* (4th ed., New York, 1913); N. M. Butler, *The International Mind* (ib., 1913); H. N. Brailsford, *The War of Steel and Gold* (London, 1914); R. N. A. Lane (Norman Angell, pseud.), *The Foundations of International Polity* (ib., 1914); S. L. Gulick, *The Flight for Peace* (New York, 1915). The chief periodicals of the peace movement are the *Advocate of Peace* (Washington), *The Herald of Peace* (London), *The Arbitrator* (ib.), the *Correspondence Bimensuelle* (Bern), *La Paix par le Droit* (Paris), *Die Friedenskarte* (Berlin).

PEACE OF ALAIS. See ALAIS, PEACE OF.

PEACE OF GOD. 1. An attempt of the Church in the latter part of the tenth century and early part of the eleventh century to do away with private warfare. Various synods in France sought to compel persons who were accustomed to bear arms to agree not to use them, but to submit their differences to the judgment of regular tribunals. The method of enforcing these decrees was by spiritual penalties. The whole scheme proved a failure, partly because the nobles loved fighting too well, partly also because there were no tribunals suited to judge differences arising between the nobles. The Church thereupon substituted the so-called Truce of God (q.v.). 2. The term is also used for the peace which the Church imposed regarding consecrated persons, places, and times. War was forbidden against priests, monks, or pilgrims, upon Sabbaths or Church festivals, and upon consecrated ground.

PEACE OF PORTSMOUTH. See RUSSO-JAPANESE WAR.

PEACE OF RYSWICK. See RYSWICK, PEACE OF.

PEACE OF THE PYRENEES. See PYRENEES, PEACE OF THE.

PEACE OF UTRECHT. See UTRECHT, PEACE OF.

PEACE OF WESTPHALIA. See WESTPHALIA, PEACE OF.

PEACE PIPE. See CALUMET.

PEACE RIVER. One of the largest tributaries of the Mackenzie system, in west Canada (Map: Canada, G 5). It rises in the north-central part of British Columbia and flows east through the Rocky Mountains, then northeast through the Province of Alberta until it joins by several arms the Great Slave River at the west end of Lake Athabasca. Its length is about 1000 miles, but, though of navigable depth through most of its course, it is obstructed by a number of rapids. Its valley is fertile.

PEACH (OF. *pesche*, Fr. *pêche*, It. *pesca*, *persica*, from Lat. *persicum*, from Gk. *περσικόν*, *persikon*, peach, neut. sing. of *Περσικός*, *Persikos*, Persian, from *Περσίς*, *Persis*, OPers. *Pārsa*, Persia; so called because the first peaches known to the Greeks came from Persia). A deciduous orchard fruit, believed to have originated in China, where it has been cultivated from very remote times. It was early introduced into Europe by way of Persia; hence its specific name, *Prunus*, or *Amygdalus*, *persica* (family Rosaceæ). The peach is a small, much-branched tree, 15 to 20 feet high, with lanceolate leaves, triplicate buds usually at each node, the two outer of which are flower buds and the middle one a leaf bud, and flowers which usually blossom before the leaves appear. The fruit is a drupe, varying much in size and color of flesh and downy skin. Peaches have been variously



PEACH BLOSSOMS AND LEAVES.

classified. Popularly they are separated into two groups, clingstones and freestones. These two classes gradually merge into each other in the different varieties, and even the same variety may be a clingstone or a freestone in different seasons. Price has classified the nearly 300 varieties of peaches grown in North America into the following five races: 1. Peen-To, a flat, medium-sized, greenish-white, very early peach, suited for commercial culture only in Florida

and some of the Gulf States. 2. South China race; rather small, oval, somewhat flattened fruit, with an extended recurved apex. 3. Spanish or Indian race, fruit late, nearly always yellow, with a hairy down. 4. North China race; fruit large, oval, with slightly recurved beak. 5. The Persian race, which includes the great majority of large, yellow or white fleshed varieties grown in the northern United States. Certain smooth-skinned peaches are popularly called nectarines. They may originate as seedlings or bud variations (sports) and may be propagated and cultivated like other varieties of the peach.

In America peaches are grown in orchards like apples; in England and middle Europe they are usually trained against walls or other protection, cultivated in pots and under glass. The tree is hardy, withstanding a winter temperature of -12° F. to -18° F. Should a few warm days occur in winter and the fruit buds start into growth, they may be easily killed at a much higher temperature. The chief difficulty in peach growing arises from the danger from late spring frosts. The peach, like the almond, blossoms early unless held in check by cool spring weather or some artificial means; hence there is often more difficulty in growing peaches in the South than in the North. These facts tend to confine the commercial culture of peaches to particular localities. In America the peach regions include certain more or less continuous areas from Connecticut to Georgia, local areas in north Florida, the eastern and southern shores of the Great Lakes, much of southern Illinois, parts of Missouri, Kansas, Arkansas, Louisiana, Oklahoma, and eastern Texas, and nearly the whole of California. Of these different peach areas the most widely known are those located in Maryland, Delaware, Georgia, and Michigan.

Peaches are propagated from seed, which is usually stratified with moist sand in the fall and left exposed to the freezing and thawing of winter, which softens and cracks the pits. In spring the pits are planted 6 to 8 inches apart in rows wide enough to admit of horse cultivation, and the following August or September the seedlings are budded with improved varieties, since the peach does not, except in a few instances, reproduce true to seed. (See BUDGING.) In the Southern States the seedlings are often budded in June, and the budded trees are set in the orchard in the fall or following spring. In the North trees budded one fall are allowed to grow the following season before transplanting to the permanent orchard. Peaches thrive best on light, sandy, gravelly, or shaly soils, though larger trees are grown on heavier soils. High or rolling lands are desirable to insure good soil and air drainage, for the peach must be planted in protected localities free from late spring frosts. Early blooming is sometimes delayed by planting on northern or northeastern slopes. Thoroughly whitewashing the trees in fall or winter also has a tendency to delay blossoming. The trees are usually set in the orchard about 20 feet apart each way, though, where careful attention is given to pruning and fertilizing, as in some commercial orchards, they may be set as close as 15 feet apart each way. The peach is not a long-lived tree, even under the most favorable conditions, seldom exceeding 30 years. The life of a commercial orchard is seldom more than seven to nine years.

Peaches are now frequently used as fillers in newly set apple orchards. With proper treatment they materially reduce the cost of bringing the slower-growing apples into bearing. The trees come into bearing about the third year after setting in the orchard. The best peach growers advocate clean cultivation in the orchard up to about the middle of summer, when a cover crop is sown and cultivation stopped. Trees thus treated ripen up their wood better and are less likely to winter-kill than if cultivated longer in the season. Potash and phosphatic fertilizers are most in demand in the peach orchard. By planting leguminous cover crops and turning these under each spring other nitrogenous fertilizers will seldom be required. Barnyard manure is not considered desirable in the peach orchard unless the land is very poor. It affects the quality of the fruit unfavorably and is likely to produce a rank unripened growth of wood.

Commercial peach growers quite generally thin their peaches to stand 5 or 6 inches apart on the branches after the usual "June drop" occurs. Peaches are borne only on wood of the preceding season's growth; hence by carefully heading back this new growth each spring they are really thinned in part at the same time. In heading in it is customary to remove about one-half of the new wood growth of the previous season. In harvesting the fruits are gathered when full grown and well colored, but before they begin to soften, graded according to size, and marketed in various forms of small packages. Besides being extensively used as a desert fruit, peaches are canned in enormous quantities, evaporated, and sold as dried peaches, and also used to some extent in the manufacture of peach brandy. The peach ranks second, as a commercial fruit, in the United States, the production in 1909 amounting to 35,470,276 bushels, valued at \$28,781,078; exports, \$499,549.

Peach Diseases. Among the most serious fungus troubles of the peach are the black spot and the brown or fruit rot. The black spot or scab (*Cladosporium carpophilum*) causes dusky brown or black spots on the side of the fruit. These spots are individually seldom more than $\frac{1}{8}$ inch in diameter, but by coalescence often injure a large area. The tissues underneath become affected and hard, and the peach lopsided, often cracked. The brown rot (*Monilia fructigena*), which also attacks cherries and plums, causes the rotting of all these fruits as they are ripening and is one of the most serious diseases to which they are subject. The affected fruits, which turn brown and appear decayed, soon become covered by an ash-colored coating of spores. The disease spreads rapidly, especially among early varieties. The twigs are also likely to be destroyed, and where the flowers are attacked, which evidence seems to show may happen, no fruit is set. These diseases may be largely prevented by thorough spraying with Bordeaux mixture. (See FUNGICIDE.) The fungicide should be diluted about one-third, because the foliage of the peach is very subject to injury from the copper compounds used in spraying. One of the most injurious fungus diseases of the peach tree and foliage is the leaf curl, due to *Eoascus deformans*. This fungus attacks the leaves, defoliating the tree. Its presence may be ascertained by the occurrence of reddish or yellowish blisters upon the leaves, which become curled or crumpled. This disease

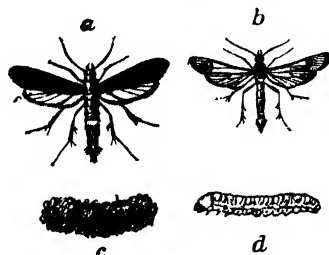
is more prevalent in damp, foggy regions than in dry, airy ones. It can be prevented by applying Bordeaux mixture of full strength to the trees before the buds begin to swell, followed after the leaves appear with a single application of the same fungicide, diluted as above. For spraying peach trees lime-sulphur solution is preferred to Bordeaux mixture, as it is less injurious. Diseases of unknown cause are peach rosette, little peach, and yellows. In rosette the twigs are stunted and the leaves bunched in rosettes. It is mostly confined to the South. The yellows is also shown in the appearance of the leaves. They are narrow, tufted, and of a yellowish color. The fruit ripens prematurely and is streaked through the flesh with red. Little peach resembles yellows, but usually is later in making its appearance. The leaves droop and are reduced in size, and the fruit is smaller and does not ripen normally. These diseases are contagious, and diseased trees should be dug out and burned as soon as discovered. Badly infested regions have been rid of the disease in this way. See ASCOMYCETES; EXOASCUS; PEACH INSECTS. See Colored Plate of DRUPES.

Bibliography. For a classification of peaches, consult: Price, "The Peach," in *Texas Agricultural Experimental Station, Bulletin 39* (Galveston, 1896); J. A. Fulton, *Peach Culture* (New York, 1899); Hume, "A Monograph of the Peen-To Group of Peaches," in *Florida Agricultural Experiment Station, Bulletin 62* (Jacksonville, 1902); Powell, "A Monograph of the Chinese Cling Group," in *Delaware Agricultural Experimental Station, Bulletin 54* (Newark, 1902); Reimer, "The Honey Peach Group," in *Florida Agricultural Experiment Station, Bulletin 73* (Jacksonville, 1904); F. A. Waugh, *The American Peach Orchard* (New York, 1913); H. P. Gould, "Growing Peaches: Varieties and Classification," in *United States Department of Agriculture, Farmers' Bulletin 633* (Washington, 1914). For peach growing, consult: Scott and Quaintance, "Spraying Peaches for the Control of Brown-Rot, Scab, and Curculio," in *United States Department of Agriculture, Farmers' Bulletin, No. 440* (Washington, 1911); L. I. Bailey, *Standard Cyclopedia of Horticulture* (New York, 1914 et seq.); H. P. Gould, "Growing Peaches: Sites, Propagation, Planting, Tillage, and Maintenance of Soil Fertility," and "Growing Peaches: Pruning, Renewal of Tops, Thinning, Interplanted Crops, and Special Practices," in *United States Department of Agriculture, Farmers' Bulletin, Nos. 631, 632* (Washington, 1915).

PEACH, VINE. See MUSKMELON.

PEACH'AM, HENRY (c.1576-c.1643). An English author, born at North Mimms, Hertford, and educated at Trinity College, Cambridge. In 1606 he published his first volume, *Graphice, or the . . . Art of Drawing with the Pen and Limning in Water Colors*. That he was a fair draftsman is clear from his illustrations in *Minerva Britannia* (1612), a work on heraldry. After two years of foreign travel he settled in London, made the acquaintance of Ben Jonson and John Selden, and became well known in literary circles. His best-known works are: *The Compleat Gentleman* (1622), of which many editions were published; *The Art of Living in London* (1642); *The Worth of a Penny, or a Caution to Keep Money* (1641, with imprint, 1647).

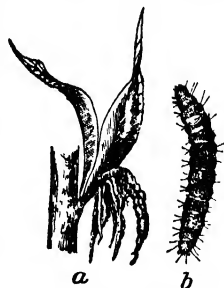
PEACH INSECTS. The principal enemy of the peach in the United States is the peach-tree borer, which is the larva of a sesiid moth (*Agertia exitialis*). The moth, which has partly transparent wings and closely resembles a wasp, is a day flier. It appears in the northern



PEACH-TREE BORER.

Stages of *Agertia exitialis*: a, adult female; b, adult male; c, cocoon; d, caterpillar.

United States and Canada from about the middle of July to August, in the South much earlier. Its eggs are laid on the bark of the peach tree near the surface of the ground. As soon as the larva has hatched it works downward in the bark to the root, forming a tunnel which soon becomes filled with gum. As the larva increases in size it devours the bark and sapwood, causing an exudation of gum which ultimately makes a thick mass about the base of the tree. Larvæ of different sizes may be found all through the fall and winter months, and the full-grown ones transform into pupæ within podlike cases made from the castings mixed with gum and threads of silk. The pupa state lasts about three weeks or more. This insect is not confined absolutely to peach, but sometimes occurs upon plum, and the presence of the larvæ is readily detected by the exudation of gum, when they may be either removed by hand, or, after some scraping, the application of hot water is effective to some degree. The best remedy, however, consists in protecting the lower part of the trunk of the tree by a band made of stiff paper or straw.



PEACH-TWIG BORER.

a, a new shoot of peach withering from attack of larva of *Anarsia lineatella*; b, the larva (enlarged).

The peach-twig borer (*Anarsia lineatella*) is a moth whose hibernating larvæ injure the trees in early spring, when they bore into the shoots of new leaves, killing the growing terminals and preventing the development of the branch. It is an Old World insect, which has done vast damage on the Pacific coast and somewhat in the East. It also attacks related fruit trees.

The fruit-tree bark beetle (*Scolytus rugulosus*) frequently damages the peach, making small holes like shot holes through the bark. The beetles will lay their eggs by preference in devitalized trees, but will occasionally attack healthy trees. Where this insect is abundant it will be well to girdle one or more trees to be used as traps. The issuing beetles will lay their eggs by preference in the trees thus injured and later they may be cut down and burned.

The San José scale is a serious enemy to the peach (see SAN JOSÉ SCALE), while the peach-tree bark louse (*Leconium persicæ*) is another scale-insect enemy of this tree. The leaves are attacked by the New York weevil (*Ichthyocerys noveboracensis*) and by the peach-tree leaf roller (*Ptycholoma persicana*) as well as by the larva of *Callimorpha lecontei*. Spraying with an arsenical poison is a remedy against these insects. The peach-tree aphid (*Myzus persicæ*) and the black peach aphid (*Aphis persicæ-niger*) are the only other enemies of any importance. These are combated by kerosene emulsion.

Consult: William Saunders, *Insects Injurious to Fruits* (Philadelphia, 1889); A. L. Quaintance, *Papers on Deciduous Fruit Insects and Insecticides* (Washington, 1912); Slingerland and Crosby, *Manual of Fruit Insects* (New York, 1914); and the publications of the United States Department of Agriculture, Division of Entomology.

PEACHTREE CREEK, BATTLE OF. A battle fought on July 20, 1864, near Atlanta, between a part of the Federal army under Gen. W. T. Sherman and a part of the Confederate Army of the Tennessee under Gen. John B. Hood. Gen. Joseph E. Johnston had foreseen that General Sherman would probably divide his army in the neighborhood of Atlanta and had planned to attack at Peachtree Creek, less than 10 miles north of Atlanta, and, if repulsed, to fall back to intrenchments nearer the city. When General Hood succeeded General Johnston, on July 18, he adopted the plan and ordered General Hardee and Gen. A. P. Stewart to attack the Federal right, consisting of the Army of the Cumberland under Gen. George H. Thomas, while crossing the stream, July 20. General Cheatham was to prevent General McPherson from coming to the aid of General Thomas. The attack was ordered to be made at 1 P. M., but was delayed until 4 P. M., by which time the Federal troops had crossed and thrown up rough intrenchments. The artillery was well handled, and a furious attack was repulsed with great slaughter. Meanwhile General McPherson had advanced more rapidly than was expected and drove his vanguard sharply in upon Hood's right flank. General Hood withdrew General Cleburne's division from General Hardee to oppose him, and a further attack was useless. The Federal troops engaged amounted to 21,655 and the Confederate to 20,250. The Federal loss in killed, wounded, and prisoners was some 2000; the Confederate, 2500. The result of this battle was to hasten the fall of Atlanta. Consult Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. iv (New York, 1901).

PEA'COCK (from *pea*, AS. *pawa*, from Lat. *pavo*, peacock, connected with Gk. *raús*, *taos*, Pers., Ar. *taivus*, *taus*, peacock + *cock*, AS. *coc*, Bret. *kok*, Alb. *cocos*, Skt. *kukkuta*, cock, onomatopoeitic in origin), or PEA'FOWL. A kind of pheasant, of which only two species are known, natives of Asia and the East Indies; birds of a large size and somewhat remarkable for magnificence of plumage. The bill is of moderate size, somewhat arched towards the tip; the cheeks nearly naked; the head crested; the tarsi rather long and armed with a single spur; the wings short; the upper tail coverts prolonged far beyond the tail and forming a splendid train capable of being erected and spread out into a great disk, the true tail being at the same time erected to support it. The common peacock

(*Pavo cristatus*) has for crest an aigrette of about 24 upright feathers, with slender almost naked shafts and broad tip. The tail consists of 20 brown stiff feathers in the peacock and 18 in the peahen. They measure less than 20 inches in length. The train derives much of its beauty from the loose barbs of its feathers, while their great number and unequal length contribute to its gorgeousness, the upper feathers being successively shorter, so that when it is erected into a disk the eyelike or moonlike spot at the tip of each feather is displayed. The blue of the neck; the green and black of the back and wings; the brown, green, violet, and gold of the tail; the arrangement of the colors, their metallic splendor, and the play of color in changing lights, render the male peacock an object of universal admiration—a sentiment in which the bird himself seems to participate, as he struts about to display himself. When the train is erected, the peacock has the power of rattling the shafts of its tail feathers against one another in a very peculiar manner by a strong muscular vibration. The peahen is much smaller than the adult male bird, has no train, and is of dull plumage, mostly brownish, except that the neck is green. In captivity individuals with white plumage not infrequently occur, in which even the eyelike spots of the tail are but faintly indicated; and pied peacocks have the deep blue of the neck and breast contrasted with pure white. The "japanned peacock" (*Pavo nigripennis*) is probably a true mutant, occurring, or at least surviving, only in a captive state. It has deep-blue wing coverts, the female is grayish white, and the chicks are pure white.

The peacock is generally supposed to have been known to the Hebrews in the time of Solomon, but it is not certain that the word commonly translated "peacocks" in the account of Solomon's importations from Tarshish (2 Chron. ix. 21) does not signify *parrots*. It is commonly stated that it first became known to the Greeks on the occasion of Alexander's expedition to India, but Aristophanes mentions it in plays written before Alexander was born. It has taken a considerable part in the folk lore and religious history of most peoples familiar with it. It is regarded as sacred by various Indian castes, was made the emblem of certain classic divinities, and its plumes are still thought "unlucky" by many persons. The peacock became common among the Greeks and Romans; a sumptuous banquet in the latter days of Roman greatness was scarcely complete without it; and wealth and folly went to the excess of providing dishes of peacocks' tongues and peacocks' brains. Throughout the Middle Ages, also, a peacock was often presented at the tables of the great on state occasions, the skin with the plumage being placed around the bird after it was cooked.

The peacock is now common in most parts of the world; generally kept, however, except in warm countries, for ornament rather than profit, although both the flesh and the eggs are very good. It readily partakes of all the ordinary food provided for the poultry yard and is fond of buds and succulent vegetables. It is hardy enough even in cold climates, except that few eggs are laid and the young are difficult to rear. The adult birds sit on trees or on the tops of houses or stacks during the keenest frosty nights, never, if they can avoid it, submitting to the confinement of a house. A sketch of its

history in civilization will be found in Stallybrass' English translation (London, 1891) of Hehn's work entitled *Cultivated Plants and Domestic Animals in their Migrations*. Peacocks are found wild in almost all parts of India and Ceylon. In general habits they resemble other pheasants. They roost at night in trees for safety, but find their food and make their nests on the ground. When alarmed on the ground in early morning with its plumage still wet with dew, the bird cannot readily take wing and is sometimes run down by dogs or by horsemen. The female lays about 10 eggs, dirty brown in color.

The other species is the green or Java peacock (*Pavo muticus*), a native of Burma, the Malay Peninsula, and Java. It is nearly equal in size to the common peacock, but of perhaps more brilliant although very similar plumage. The cheeks and around the eyes are yellow, the neck and other fore parts greenish with golden reflections. The crest is longer than that of the common peacock, its feathers less equal and webbed along their whole length. Except for the lack of a train, the female closely resembles her mate. On the basis of the sequence of tail molt Beebe has recently established a trenchant character for the subfamily Pavoninae. Consult the works of Jordan, Hume, Oates, Legge, Seebohm, Blyth, and other writers on East Indian ornithology, also Angelo de Gubernatis, *Zoological Mythology. Legends of Animals* (2 vols., New York, 1872); Charles De Kay, *Bird Gods of Ancient Europe* (ib., 1898); Charles Darwin, *Variation of Animals and Plants under Domestication* (authorized ed., 2 vols., ib., 1900); for the most complete account, C. W. Beebe, *Monograph of the Pheasants* (London, 1915). See Plate of PEACOCKS, ETC.

PEACOCK, SIR BARNES (1810-90). An English judge. Called to the bar at Lincoln's Inn in 1836, he gained a great reputation as a lawyer by successfully defending Daniel O'Connell (q.v.) in 1844. He became a legal member of the Supreme Council of India in 1852, served as Chief Justice at Calcutta in 1859-70, and was appointed a member of the judicial committee of the Privy Council in 1872. Peacock was knighted in 1859.

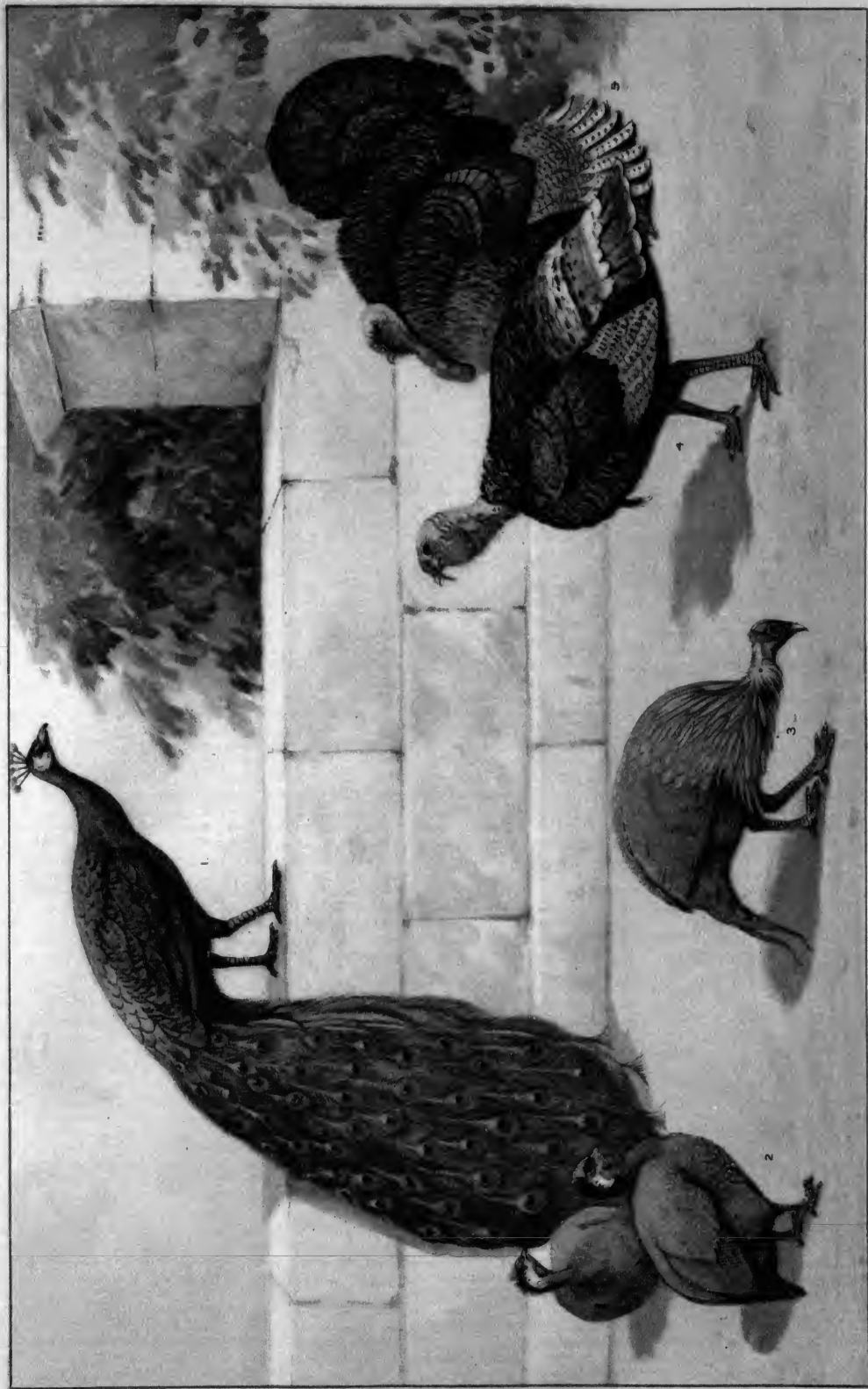
PEACOCK, GEORGE (1791-1858). An English mathematician and divine, born at Thornton Hall, Denton. He was educated at Richmond and at Trinity College, Cambridge, where he became second wrangler (1813), fellow (1814), and tutor and lecturer (1815). He was a fellow student with Herschel, Babbage, and Woodhouse. These four translated Lacroix's *Differential and Integral Calculus* (1816) and were instrumental in the introduction of the continental notation of the calculus into Cambridge. In 1837 he was elected Lowndean professor of astronomy at Cambridge, which office he retained until his death, although he soon treated it as a sinecure. In 1839 he became dean of Ely and removed thither. Peacock was one of the founders of the Cambridge University Philosophical Society (1819), was a fellow of the Royal Astronomical and Geological societies and was connected with other societies. In 1838 and 1843 he was a member of the commission for standard weights and measures and advocated a system of decimal coinage. In 1850 he was a member of the royal commission and in 1855 of the parliamentary commission for drawing up new statutes for the university and col-

leges. His principal mathematical works are: *A Collection of Examples of the Application of the Differential and Integral Calculus* (Cambridge, 1820); contributions to the *Encyclopædia Metropolitana* (1825-26); *A Treatise on Algebra* (Cambridge, 1830; 2d ed., 2 vols., 1842-45); *Report on the Recent Progress and Present State of Certain Branches of Analysis* (British Association Reports, 1834); *Remarks on Decimal Nomenclature of Coins, Weights, and Measures* (1841). He also wrote the *Life of Thomas Young, M.D.* (London, 1855).

PEACOCK, THOMAS LOVE (1785-1866). An English novelist and poet. He was born at Weymouth, Oct. 18, 1785, and, his father dying soon afterward, was educated in a somewhat desultory fashion at home and at a private school until he was 13. He made his first publication, in poetry, before he was 20. In 1812, on one of his tours in Wales, he made the acquaintance of Shelley and his wife, Harriet, and for several years this friendship was the most notable thing in his life. Shelley made him his executor, with Byron, and it is to him that we owe our best materials for the poet's biography. In 1816, by the publication of *Headlong Hall*, Peacock "took his station and degree" in literature. Three years later he obtained an important position under the East India Company and with James Mill was appointed one of the examiners of Indian correspondence. He continued at India House for 38 years, succeeding Mill as chief examiner in 1836. Finally he retired on an ample pension, to live thenceforth quietly with his books and his garden at Halliford on his beloved Thames. His death occurred Jan. 23, 1866.

Though the charming ballads scattered throughout his books evidence his poetic ability, it is as a satirist that Peacock will be remembered. To Shelley he described *Maid Marian* (written 1818, published 1822) as "a comic romance of the twelfth century, which I shall make the vehicle of much oblique satire on all the oppressions that are done under the sun"—a phrase which, if we widen it to include the oppressions of cant and ignorance, is not a bad summary of the most of his work. In the ordinary qualifications of the novelist—plot construction, human interest, character drawing—he is deficient. But in genial satire (aided by a real passion for beauty and a singularly pure and elegant style) he has had few equals in English literature, in fact, his fiction has been not inaptly called the best modern representative of the Aristophanic comedy. His characters, despite their suggestion of Shelley or Coleridge or Canning, are rather types than real people; like Ben Jonson and his school, he presents "humors" in preference to men. His other books are: *Melincourt* (1817); *Nightmare Abbey* (1818), the best known, with *Headlong Hall*; *The Misfortunes of Elphin* (1829); *Crotchet Castle* (1831), which contains his highest comedy; *Paper Money Lyrics and Other Poems* (1837), *Gryll Grange* (1861), the mellow product of his old age. His principal works were published in collected editions in 1875 (ed. Sir Henry Cole) and 1891 (ed. Garnett), with valuable critical and biographical matter. Consult: G. E. Santsbury, in *Essays in English Literature, 1780-1860* (1st series, London, 1890); *Peacock's Memoirs of Shelley with Shelley's Letters to Peacock*, edited by H. F. B. Brett-Smith (ib., 1909); Carl Van Doren, *Life*

PEACOCK, TURKEY & GUINEA - FOWL



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- 1 PEACOCK - PAVO CRISTATUS
- 2 GUINEA-FOWL - NUMIDA MELEAGRIS
- 3 VULTURINE OR ROYAL GUINEA-FOWL - ACRYLLIUM VULTURINUM
- 4 DOMESTIC TURKEY
- 5 WILD TURKEY - MELEAGRIS GALLOPAVO

JULIUS BIER & CO. LITH., N.Y.

(New York, 1911); A. M. Freeman, *Peacock* (ib., 1911); L. H. Vincent, *Dandies and Men of Letters* (Boston, 1913).

PEACOCK FISH. A gorgeous European wrasse (*Ctenilabrus pavo*).

PEACOCK ORE. See BORNITE.

PEACOCK PHEASANT. A pheasant, closely allied to the argus pheasants, of the genera *Polyplectron* and *Chalcurus*, of which several species inhabit the Indo-Chinese region and the neighboring islands. The best-known species is *Polyplectron chinquis* or *bicalcaratus*, which is brown with a black head and has the upper plumage adorned with large ocelli resembling those of a peacock's tail. They frequent the forests of hilly regions. The female has the peculiar habit of using her large tail as a shelter for her young. These birds have two great spurs upon the tarsus. Six forms have been recognized. The bronze-tailed peacock pheasants (*Chalcurus*) are two in number, living in the Malay Peninsula and Sumatra. They are more generalized in plumage than the members of the other genus, with the spots fewer and more diffuse. See Plate of PHEASANTS.

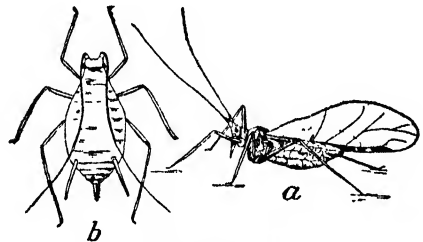
PEA CRAB. See OYSTER CRAB.

PEA INSECTS. There are about 20 species of insects which are more or less injurious to peas. The pea weevil (*Bruchus pisorum*) is very abundant. It probably originated in Oriental regions, although some authors give North America as its native home. It is now generally found wherever peas are cultivated except in the colder countries of Europe and Canada and is very abundant throughout the United States—so abundant, in fact, that in eating green peas we consume a larva or grub with nearly every pea. The beetles appear on the vines when the peas are in blossom, and the eggs are deposited singly upon the surface of the pods. The larva bores through the pod into a pea and when full-grown transforms to pupa, the adults issuing at varying periods from the end of July until late in the autumn, frequently in the Northern States remaining in the pea until the following spring, when many are planted in the seed. The insect hibernates in the adult condition and has only a single generation each year. It does not breed in dried peas, and the new generation for another year is dependent upon the beetles which are contained in planted seed or which escape from the storeroom. The simplest and most effective remedy consists in holding seed peas in a closed receptacle over one year: the beetles which issue die without being able to lay their eggs in the field. Late planting is also frequently effective, and weevilly peas may be made safe by fumigation with bisulphide of carbon.

Certain of the blister beetles are frequently injurious to both beans and peas by devouring the leaves, particularly the ash-gray blister beetle (*Macrobasis unicolor*), which also feeds upon other leguminous plants. The beetles are abundant in June and July and may be controlled by spraying with Paris green or by driving them in the early morning into windrows of straw or hay, where they are burned. In their early stages these insects are beneficial by destroying the egg pods of grasshoppers. The maturing pods of peas and cowpeas and other leguminous plants are frequently damaged by the bollworm or corn-ear worm (larva of *Heliothis obsoleta*); and the young plants as they come from the ground are frequently damaged by cutworms

and other caterpillars. (See CUTWORM; OWLET MOTH.) The European pea moth (*Semasia nigricana*) has been introduced into Canada, where it has injured peas for a number of years. It is probably only a question of time when it will make its appearance in the northern United States. A plant bug (*Halticus citri*) damages peas and beans in some of the Central States, and several species of leaf hoppers infest the plant.

The most serious enemy to the pea crop of recent years has been the destructive green pea aphid (*Macrosiphum pisi*), which caused a loss of many hundreds of thousands of dollars to pea growers in the United States during 1899 and 1900. Prior to that time, and since, it has not been such a serious pest. During the first season of its abundance it overran and laid waste fields of peas from Nova Scotia and Maine to Virginia and Maryland, as well as in neighboring States, destroying about 50 per cent of the crop. The loss during 1899 was estimated at \$3,000,000, and during 1900, as early as June 15, at \$4,000,000. In Europe, also, it is destructive of peas, clovers, vetches, and related plants. The insect multiplies with great rapidity and in favorable seasons is always likely to do enormous damage. The remedies which have been employed are spraying with kerosene soap emulsion and the use of the brush and cultivator method. In the latter case the peas have been grown in rows sufficiently wide apart to admit of a one-horse cultivator, and the lice are brushed from the plants with boughs of pine, the cultivator following immediately afterward and burying the lice. Early planting and



GREEN PEA APHIS.

a, winged female of *Macrosiphum pisi* in feeding position; b, wingless female.

very late planting have also been advised, but rotation of crops by which no leguminous crop immediately follows another one offers apparently the best chance of immunity. Consult: F. H. Chittenden, *Insects Injurious to Beans and Peas* (Washington, 1898); id., *The Destructive Green Pea Louse* (ib., 1901); id., *Insects Injurious to Vegetables* (New York, 1907).

PEAKE, ARTHUR SAMUEL (1865-). An English biblical scholar, born at Leek, Staffordshire, and educated at St. John's College, Oxford. In 1890-92 he was a lecturer at Mansfield College (Congregational), Oxford, and from 1890 to 1897 was fellow of Merton College. In 1895-1912 he served as lecturer in the Lancashire Independent College, from 1904 to 1912 also in the United Methodist College at Manchester. In 1892 he had become tutor in the Manchester Primitive Methodist College and in 1904 Rylands professor of biblical exegesis in Victoria University. The University of Aberdeen made him an honorary D.D. in 1907. Among Dr. Peake's publications are: *A Guide*

to *Biblical Study* (1897), commentaries on Hebrews (1902; Century Bible), Colossians (1903; Expositor's Greek Testament), Job (1905; Century Bible), Jeremiah (1910-12; ib.), and Isaiah xl-lxvi (1912); *The Problem of Suffering in the Old Testament* (1904); *The Religion of Israel* (1908); *Critical Introduction to the New Testament* (1909); *Heroes and Martyrs of Faith* (1910); *The Bible: Its Origin, Significance, and Abiding Worth* (1913).

PEALE, pēl, CHARLES WILSON (1741-1827). An American portrait painter. He was born at Chesterton, Md., April 16, 1741, was apprenticed as a boy to a saddler in Baltimore, in which city he received some slight instruction in painting from Hesselius, an English painter. In 1768-69 he studied with Copley in Boston and in 1770 went to London, where he was a pupil of Benjamin West. West, when Peale's funds gave out, received him into his own house. In 1774 he returned to America and practiced portrait painting at Annapolis, but two years later he removed to Philadelphia. During the Revolution he commanded a company at Trenton and Germantown and painted the portraits of many prominent officers. Of Washington Peale painted 14 likenesses, the earliest of which represents him in the uniform of a Virginia colonel and is the only one surviving of those painted before the Revolution. The most notable one, ordered by Lafayette for the French King, was purchased during the French Revolution and presented to the National Gallery, at Washington, where it is still preserved. Another portrait of Washington was painted in 1780 for Princeton College; another still is in the Metropolitan Museum, New York. Other portraits include those of Generals Lincoln, Greene, Rochambeau, Reed, Gates, and De Kalb, as well as Jefferson, Jackson, and Clay. His portrait of Hamilton is in the New York Historical Society, which also possesses an interesting portrait group of the artist and his family, one of his last works. At 81 years of age he painted "Christ Healing the Sick," and two years later a good full-length portrait of himself, now in the Pennsylvania Academy. Peale was a man of very versatile talents. In 1785 the discovery of the bones of a mastodon gave him the idea of founding a museum. It contained a variety of specimens, chiefly of natural history, upon which he discoursed learnedly. He was instrumental in founding (1805) the Pennsylvania Academy of the Fine Arts, the first of its kind in the United States. As a painter he was the best in his country from the departure of Copley (q.v.) for England until the return of Gilbert Stuart (q.v.) in 1793. His early style was stiff and archaic, resembling Copley's, but these qualities were softened under the instruction of West. To modern eyes his pictures seem wooden in design and harsh in color. Of his 11 children who were named after famous artists, three distinguished themselves in art. REMBRANDT (see below) was the most famous; RAPHAËLE (1774-1825) was one of the first American painters of still life; TITIAN (1800-85) made drawings of animals. JAMES PEALE, brother of Charles Wilson, was best known as a miniaturist, in which branch he did good work. Consult: Dunlap, *History of the Arts of Design in the United States* (New York, 1834); E. B. Johnston, *Original Portraits of Washington* (Boston, 1882); Samuel Isham, *History of*

American Painting (New York, 1910). See Plate of FRANKLIN, BENJAMIN.

PEALE, PATRICK. See SECKENDORF, GUSTAV ANTON VON.

PEALE, REMBRANDT (1778-1860). An American portrait and historical painter and author. He was born in Bucks Co., Pa., Feb. 22, 1778, the son and pupil of Charles Wilson Peale. From 1796 to 1801 he practiced portrait painting in Charleston, S. C., and then went to London, where he studied under West, returning to the United States in 1803. In 1807 and again in 1809 he visited Paris, where, according to his own statement, the painter David sat to him for a portrait, pressed him to remain, promising him all the Imperial portraits. Among other sitters in Paris was Denon, director general of the state museums. In 1810 he returned to America and practiced portrait painting at Philadelphia, New York, Charleston, and at Baltimore, where he established a museum and picture gallery. In 1829 he went abroad again, visiting France and Italy, and in 1833 he established himself in London, returning afterward to the United States. Peale painted several portraits of Washington, the most notable of which, executed in 1823, was exhibited in Rome, Florence, and London and was bought by Congress upon his return to America in 1832. His other works include the "Court of Death" (1820, Detroit Art Gallery), the "Roman Daughter" (1810, Boston Museum), and the "Ascent of Elijah"; portraits of Gilbert Stuart, Thomas Jefferson, and Mrs. Madison (New York Historical Society), of Cuvier and Houdon (Pennsylvania Academy), and an equestrian portrait of Washington (Independence Hall, Philadelphia). Owing to his French experience his work was more accurate in drawing than that of most of his contemporaries, but the color is dull and the style less vigorous than his father's. He was also a skillful lithographer and in 1827 won a silver medal at the Franklin Institute for a portrait of Washington. He lectured on natural history and is the author of *An Account of the Skeleton of the Mammoth* (London, 1802). His other books include: *Notes on Italy* (Philadelphia, 1831); *Graphics* (1841); *Reminiscences of Art and Artists* (1845). He died in Philadelphia, Oct. 3, 1860. Consult C. E. Lester, *The Artists of America* (New York, 1846).

PEAN, pēn (OF. *pane*, *panne*, Fr. *panne*, skin, fur, from ML. *panna*, *penna*, skin, from Lat. *pannus*, cloth, or *penna*, feather). One of the furs borne in heraldry (q.v.).

PÉAN, pā'ān', JULES EMILE (1830-98). A French surgeon. He was born at Marboué, near Chateaudun, Eure-et-Loire, and after graduating in medicine at the University of Paris (1860) was at once appointed prosecteur. As hospital surgeon from 1868 to 1892 he was attached to the hospitals of the Enfants Assistés, Loucine, Saint-Antoine, and Saint-Louis. At the end of this period he resigned to open a private hospital. In 1885 he became a member of the Académie de Médecine. Péan was one of the greatest of French abdominal surgeons—he was the first in France successfully to perform ovariectomy (1864), was one of the earliest continental followers of Lister, and the first to introduce into France vaginal extirpation of the uterus and its annexa, etc. He also invented several important surgical and gynecological instruments. Besides editing volumes ii-iv of the second edition of Nélaton's *Elements de*

pathologie chirurgicale (1872), he wrote: *De la scapulargie et de la résection scapulo-humérale* (1860); *Ovariectomie et splénotomie* (1869); *Hystérotomie* (1873); *Leçons de clinique chirurgicale professée à l'Hôpital Saint-Louis* (9

Feeding Value. Peanuts are used as a forage crop and as hay. The ripe nuts and the cake which remains after the oil is expressed are also fed. The percentage composition of a number of peanut products follows:

COMPOSITION OF PEANUT KERNELS, FORAGE, ETC.

	Water	Protein	Fat	Nitrogen-free extract	Crude fibre	Ash
Peanut kernels	7.9	27.2	45.2	13.1	3.9	2.6
Peanut vines (green)	31.9	7.4	3.4	27.1	22.0	8.2
Peanut hay	7.8	10.8	1.7	43.6	20.4	15.7
Peanut hulls (shells)	12.9	6.3	2.3	16.9	58.6	3.0

vols., 1879-95); *Diagnostic et traitement des tumeurs de l'abdomen et du bassin* (1880-99).

PEANO, PÀ-R'NÒ, GIUSEPPE (1858-). An Italian mathematician. After serving more than five years as assistant professor, in 1896 he became professor of integral calculus at the University of Turin. In 1908-10 he was also professor of differential calculus at the Reale Politecnico of Turin. His publications include: *I principii di geometria logicamente esposti* (1889); *Notations de logique mathématique—Introduction au formulaire de mathématique publié par la "Rivista de matematica"* (1894); "Saggio di calcolo geometrico," in the *Atti della Reale Accademia delle scienze di Torino* (1896); *Formulaire de mathématiques* (1901).

PEANUT (*Arachis hypogæa*). An annual plant of the family Leguminosæ, also called groundnut, earthnut, ground pea, goober, and pindar in various localities. It grows from 1 to 2 feet high, with thick, greenish, hairy stems and spreading branches. After the petals have fallen the peduncle bends downward and pushes into the ground, where the fruit or pod develops. The pods are pale yellowish, wrinkled, slightly curved, often contracted in the middle, and contain from one to three seeds. The peanut is thought to be a native of Brazil, where a number of species of the genus are indigenous. Soon after the discovery of South America it was introduced into the Old World and is now grown in all the warm regions of the globe. Only since 1866 has it been an important crop in the United States, where it is mainly grown in the Southern States, particularly Virginia, North Carolina, Georgia, and Tennessee. The conditions best suited to the culture of the peanut are an early and warm spring, a hot summer free from drought, and a limy, sandy, friable loam. Lime in some form must be added to soils deficient in this element. The soil is finely pulverized from 4 to 5 inches deep and the seed planted about 1 inch deep in rows from 28 to 36 inches apart and from 12 to 16 inches in the row, when danger of late spring frosts has passed. About two bushels of nuts in the pod are required to plant an acre. After planting and during the growing period of the crop the soil is kept loose and open and free from weeds. The crop is harvested before frost in the fall, the plants being loosened by means of a special plow, then taken up and put into shocks. After drying from 15 to 20 days the pods are picked. Fifty bushels of pods and from one to two tons of hay or straw per acre is considered a good yield. In special establishments known as recleaners or factories the pods are polished and sorted before being put upon the market.

Peanut kernels resemble other leguminous seeds in being rich in protein. The fat content is also high. Since peanut hay is apt to contain considerable dirt, it should be fed from low mangers or troughs. If immature pods are left on the vines, no other food is necessary during the winter. It has been estimated that pigs under 100 pounds would make from \$12 to \$20 worth of pork from an acre of peanuts if fed a moderate allowance of corn or corn meal in addition. Pasturing pigs has the advantage that the animals gather the crop and save the cost of harvesting. Peanuts make a soft pork and lard, a disadvantage that may be overcome by feeding corn exclusively for a month before slaughtering. Peanut cake mixed with less concentrated feeds has been found to be a useful cattle food. A material called "peanut meal" is made by grinding peanut hulls, immature peanuts, and those of an inferior grade.

Production and Use as Food. The production of peanuts in the United States showed a marked increase in 1909, the latest census year, having been 19,415,000 bushels against 11,964,000 in 1899. The value of the 1909 crop was \$18,272,000 against \$7,280,000 in 1899. The exports in 1914 were 8,055,000 lbs., valued at \$421,367. Many nuts are now used in the manufacture of confectionery and peanut butter. The latter is prepared by grinding the nut and generally mixing it with a little water. Peanut oil is made in large quantities in Europe from African-raised nuts. The shelled nuts contain 30 to 50 per cent of oil, which, if carefully made, is of good flavor and is used for various culinary purposes and in the arts. The peanut is at present used more as a luxury or for eating at odd times than as a staple article of diet. It is, however, wholesome, nutritious, and cheap. Little is definitely known concerning its digestibility. It is apparently more easily digested if eaten with other foods than if eaten alone. Attempts to introduce peanut soups, cakes, etc., into the diet have not proved very successful. Consult: W. N. Roper, *The Peanut and its Culture* (Petersburg, Va., 1905); L. H. Bailey, *Cyclopedia of American Agriculture*, vol. ii (New York, 1907); W. R. Beattie, *The Peanut*, United States Department of Agriculture, *Farmers' Bulletin No. 431* (Washington, 1911). See Plate of LEXEMES.

PEA ORE. A form of compact brown or red hematite, consisting of round smooth grains, from the size of mustard seed to that of small peas. Sometimes the grains are still smaller and flattened. The Clinton iron ore, found in the Silurian of the eastern United States, is often of this nature.

PEAR (AS. *peru*, *pere*, from Lat. *pirum*, pear,

pirus, pear tree; connected with Gk. *ἄριος*, *apios*, pear). A deciduous orchard fruit (*Pyrus communis*) of temperate climates, belonging to the rose family, a native of Europe, early introduced into America. This species is the parent of thousands of cultivated varieties. The small apple-shaped, gritty sand or Chinese pear (*Pyrus sinensis*) is seldom grown except for ornament and as a stock, the fruit being inedible unless baked or preserved. Some hybrids between these two species have arisen, two of which, Le Conte and Kieffer, are among the most important commercial varieties grown in America. Pear orchards resemble apple orchards in appearance, except that the trees naturally grow much more erect and pyramidal. When left to themselves they frequently grow to a height of 60 feet or more. Pear flowers are usually white and borne on spurs that continue to bear fruit and to branch for years. The fruit is a pome, more juicy and melting or buttery than the apple and less tart. It is one of the best dessert fruits and is extensively used for canning, preserving, etc., and in some parts of Europe large quantities are used in the production of cider or perry.

While pears are grown over a wide territory in the temperate zones, the countries of largest production are France and the United States. In America they stand fourth in importance among the orchard fruits. According to the thirteenth census the production in the United States in 1909 was 8,840,733 bushels, worth \$7,910,000. The best American pear districts are found in the Northeastern States, from New England west to the Great Lakes, and in California and parts of Oregon and Washington. Blight seriously interferes with pear growing in the Middle West and South, while in the Northwest only the inferior Russian sorts are hardy enough to thrive. Such hybrid varieties as Le Conte, Kieffer, Garber, etc., are less subject to blight. They are productive and well adapted to a wide range of country, extending from New Jersey southward to Florida and Texas.

The pear is grown in orchards, either as a standard or dwarf. Standard trees are produced by grafting or budding the variety which it is wished to grow upon a seedling pear; the best stock for the purpose is obtained by growing the seed of the wild pear of Europe. Dwarf trees are produced by grafting or budding on quince stock. Pears thus treated seldom grow more than 12 to 15 feet high. They come into bearing earlier than standard trees, usually within four years from planting in the orchard, and are especially valuable where land is expensive or for planting between other trees. Frequently dwarfing increases the size of the fruit and improves its quality.

The best soil for standard pears is a well-drained heavy clay loam. Dwarf pears will do well on lighter soils. Rapid growth is not sought for in pear culture, since it is believed to favor the attacks of blight. For this reason, stable or any other nitrogenous manures are not advocated for the pear orchard except on very poor soils. Trees are set in the orchard when two or three years from the bud, standard trees from 18 to 25 feet apart each way and dwarfs 10 to 16 feet. Dwarf trees are set deep, 4 to 6 inches below the union, to prevent growth of the stock and to lessen the danger from breaking off in storms. Cultivation is practiced

only during the spring and early summer in order to prevent a late, sappy wood growth. Recent investigations have clearly shown that many varieties of pears are self-sterile and must be planted with other varieties to cross-pollinize them in order to produce fruit. Such varieties should therefore never be planted in orchards alone. It is probable that almost any variety blossoming at the same time as these self-sterile sorts may be used as pollinizers. In the orchard one or two rows of one variety should be alternated with one or two rows of another variety blossoming at the same time.

Pears are harvested before they are fully ripe and while they are still hard. Thus handled they acquire a better color and flavor, develop less grit in the flesh, and are less likely to decay at the core than when allowed to ripen on the tree. After picking they are stored in shallow boxes or racks in a cool room away from all drafts of air, which tend to shrivel up the fruit. Late winter pears may be left on the trees as long as practicable before frost. Pears grown for market are gathered and placed in barrels or boxes at once. European and California fancy pears are wrapped in paper like oranges before marketing. In recent years the United States has developed a considerable export trade in fresh pears; \$1,402,924 worth were exported in 1914.

Pear Diseases. The pear and its fruit are subject to the same diseases as the apple, for the description and prevention of which see **APPLE, Diseases**. In addition there are two diseases which, although occurring upon the apple and quince, are so much more frequent upon the pear as to be generally associated with it. The first is the leaf spot, due to the fungus *Entomosporium maculatum*, which occurs upon the leaves, fruits, and young twigs—upon the leaves as reddish-brown spots which coalesce more or less and destroy the leaf, sometimes defoliating the tree; upon the stems black, as dead spots; upon the fruit reddish spots beneath which the tissues become hard and cork-like, the fruit often cracking and rotting as a result of the attack. This disease may be easily controlled by the application of Bordeaux mixture or other fungicide (q.v.). The second is pear blight or fire blight (q.v.).

Bibliography. P. T. Quinn, *Pear Culture for Profit* (New York, 1889); M. B. Waite, "Pollination of Pear Flowers," in *United States Department Agricultural Division Vegetable Pathology, Bulletin No. 5* (Washington, 1895); E. Bartrum, *Book of Pears and Plums* (New York, 1902); W. H. Ragan, *Nomenclature of the Pear: A Catalogue of the Known Varieties Referred to in American Publications from 1804 to 1907* (Washington, 1908); Brackett, "The Pear and how to Grow it," in *United States Department of Agriculture, Farmers' Bulletin No. 482* (ib., 1912); L. H. Bailey, *Standard Cyclopedia of Horticulture* (New York, 1914 et seq.). See **PEAR INSECTS**; **Plate of FLOWERS**.

PEAR, PRICKLY. A species of cactus. See **PRICKLY PEAR**.

PEAR BLIGHT. See **FIRE BLIGHT**.

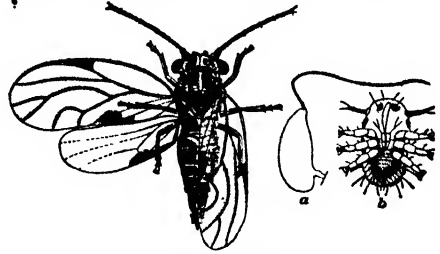
PEARCE, pērs, CHARLES SPRAGUE (1851-1914). An American figure and historical painter, born in Boston. He studied under Bonnat in Paris, lived most of his life in France, and was a frequent exhibitor at the Salon. He was one of the first members of the Society of American Artists, an associate of the National

Academy, an Officer of the Legion of Honor, and a member of several foreign orders. He received numerous gold medals and the grand diploma at Berlin (1894). His earliest paintings are historical pictures, such as "The Beheading of John the Baptist" (Chicago Art Institute). Later he chose modern subjects with a preference for the shepherdesses and peasant girls of Picardy. His works are in the realistic French manner, harmonious in tone, with notable technical qualities and skill in composition and draftsmanship. Among the best known are: "The Shepherdess" (1866); "Across the Common" (Buffalo Academy); "Fantaisie" (Pennsylvania Academy); and "Meditation" (Metropolitan Museum, New York). He did some mural painting in the north hall of the Congressional Library in Washington.

PEA RIDGE, BATTLE OF. A battle of the Civil War in America, fought at Pea Ridge in northwest Arkansas, near the Missouri boundary, March 7 and 8, 1862. In January, 1862, Gen. S. R. Curtis with 10,500 Federal troops, composing the Army of the Southwest, moved against Gen. Sterling Price, commanding Missouri State troops at Springfield. General Price retired into Arkansas, where he was joined by Gen. Benjamin McCulloch with his division, and General Van Dorn took chief command. General Curtis followed and took a strong position at Pea Ridge, on an eminence in the Ozark Mountains, and awaited an attack. General Van Dorn advanced with 14,000 men and was joined by Gen. Albert Pike with a brigade of Indians, which had been recruited in Indian Territory. His plan was to strike the rear of the Federal army and cut off its communications. General Curtis had changed front, but the Federal right was driven back 2 miles on March 7. The attack by the Confederates on the Federal left was repulsed with great slaughter, Generals McCulloch and McIntosh being among the killed. The Indians were entirely useless and scattered at the beginning of the artillery fire. The next morning General Van Dorn retreated under cover of his artillery, but General Curtis drew his men into an arc of a circle and poured in a destructive cross fire. The Federal loss was 1384 killed, wounded, and prisoners; the Confederate was given at 800 exclusive of Indians, but was undoubtedly larger. The result of this first victory west of the Mississippi saved Missouri to the Union cause. This encounter was known to the Confederates as the battle of Elkhorn.

PEAR INSECTS. The insects attacking the pear are identical in many instances with those which attack the apples, the apple borers, the San José scale, the oyster-shell bark louse, and the codling moth all being found to attack the pear. The pear-tree psylla (*Psylla pyricola*) is confined to the pear and is common and rather destructive in the northern United States, extending westward as far as Michigan and southward to Maryland and Virginia. It was imported about 1832 from Europe, where it occurs abundantly, especially in Austria. The orange-yellow eggs are laid by the adult insect upon the leaves of the trees, and the young insects, yellow in color with crimson eyes, begin immediately to suck the sap from the leaf. It grows rather rapidly and has several generations (four or five) in the course of a summer. It hibernates in the adult condition in crevices on the trunk of the tree or under leaves on the

ground. It is preyed upon by a large number of natural enemies, principally by the golden-eyed lacewing flies and the larvae of coccinellid (or ladybird) beetles. The best remedy is a



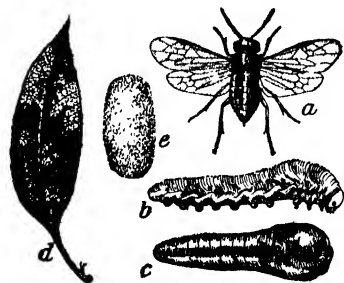
PEAR PSYLLA.

Psylla pyricola: adult; an egg (a); and larva (b) from beneath. Greatly enlarged.

spring application of kerosene emulsion spray when the leaves are first unfolded. A combination of kerosene emulsion and Bordeaux mixture is recommended where pear blight occurs in the same orchard.

A bark-boring beetle, known as the pear-blight beetle (*Xyleborus dispar*), frequently causes the death of many twigs of the pear tree by making small perforations at the bases of the buds. The adult beetle deposits its egg on the bud, and the young larva bores down, following the course of the eye of the bud, towards the pith, around which it passes, consuming the tissues in its course, thus interfering with the circulation and causing the twig to wither. The adult insect issues in June or July and deposits its eggs during August. The only remedy which has been suggested is to cut off the blighted limbs below the injured part and burn them before the beetle has escaped. Another borer, the sinuate pear borer (*Agilus sinuatus*), has been introduced into the United States from Europe within recent years. This borer in the larval condition feeds between the bark and wood in pear trees, especially in the trunk and larger branches, making long zigzag galleries, finally girdling the tree and killing it. It lives two years in the larval condition.

Among the numerous insects which attack the leaves of the pear is the so-called pear slug,



PEAR SLUG.

a, adult sawfly, female; b, larva with slime removed; c, larva in normal state (the slug); d, an affected leaf; e, cocoon.

which is the larva of a sawfly (*Eriocompoides limacina*). The adult is a small insect, smaller than the house fly and glossy black in color. It was probably introduced into the United States from Europe towards the close of the eighteenth

century. The eggs are laid under the surface of the leaf, and the young larvæ hatch and grow rapidly, covering themselves with a slimy secretion. There are two generations each year, and the larvæ when abundant skeletonize nearly all the leaves on large trees. The best remedy is to spray with an arsenical wash or with a soap solution, or hellebore may be used either as a dry powder or as a wet spray. Heavy rains will often destroy them, and a forcible water spray will wash them from the leaves.

Among caterpillars which feed upon the pear are the white-marked tussock moth (*Hemerocampa leucostigma*), the red-humped apple-tree caterpillar (*Schizura concinna*), the fall web-worm (*Hyphantria cunea*), the cecropia moth (*Attacus cecropia*), the eye-spotted bud moth (*Tmetocera ocellana*), and others. The plum curculio and the quince curculio (qq.v.) injure pears as well as plums and quinces, although not so extensively. Consult: William Saunders, *Insects Injurious to Fruits* (Philadelphia, 1889); J. B. Smith, *Manual of Economic Entomology* (ib., 1896); Slingerland and Crosby, *Manual of Fruit Insects* (New York, 1914).

PEARL (from ML. *perula*, *perulus*, *perla*, pearl, probably variants of *pirula*, dim. of Lat. *pirum*, pear). A morbid product formed from the pearly nacre of the interior of the pearl mussel (*Meleagrina margaritifera*) and other bivalves. It is often due to the irritation caused by the presence of a grain of sand or some other foreign body lodged between the mantle of the animal and the shell; an extra amount of pearly matter is thus secreted and forms roughnesses or projections on the inside of the shell, which, if becoming free and regularly spherical, form one or more pearls. Recent authorities state that pearls are also due to the presence of distomæ. It has been noticed that when the pearl oyster (*Meleagrina*) is large, well formed, and with ample space for individual development, pearls scarcely occur at all, but when the shells are crowded together and become humped and distorted, as well as affording cover for all kinds of marine worms and parasitic creatures, then pearls are sure to be found. (Cooke.) The pearl-oyster fishery is carried on in the Aru Islands, the Sulu Archipelago, the Philippine Islands, Burma, the Persian Gulf, the Red Sea, at Ceylon, along the coasts of Northeastern, Northern, Northwestern, and Western Australia, at New Guinea, and at the Pearl Islands on the Bay of Panama. This species also occurs along the coast of Lower California and in the South Pacific in the Paumotu, Gambier, and Navigators islands, and also at Madagascar. The shell is very large, about 8 to 10 and even 15 inches in diameter, while the valves are very thick and heavy, and in young individuals the outer surface is very rough and corrugated. The largest pearl that is known is said to measure 2 inches long, 4 inches round, and to weigh 1800 grains.

The mother-of-pearl is the internal nacre or nacreous laminae of this oyster. It is utilized in the manufacture of buttons, studs, knife handles, fans, cardcases, brooches, boxes, and all kinds of inlaid work.

Pearls may be formed in almost any bivalve, and some of the most valuable are taken from the shells of fresh-water mussels, but these are usually small and called seed pearls; they also occur in tolerable abundance in the common mussel of the Atlantic coast of North America

(*Mytilus edulis*), very fair specimens at times being found; also in oysters, in *Placuna placenta* of the Pacific, in many species of *Pinna*, and in the giant clam (*Tridacna*). Pearls are sometimes formed in univalve shells; thus, pink pearls have been taken from the giant conch shell (*Strombus gigas*) of the West Indies.

Pearl Fisheries. The average annual value of the pearl fishery of Northern Australia is about \$300,000, the industry having been founded at Thursday Island. It appears that the profits of the fishery are made out of the pearl shell only, because so many pearls are stolen by divers. Western Australia produces \$500,000 worth annually. Pearls and shells to the value of over \$1,000,000 were exported in 1905. Saville Kent distinguishes two species of pearl shells, viz., the large white shell (*Meleagrina margaritifera*) and a smaller black-edged form which he names *Meleagrina nigro-marginata*. Under favorable conditions the shell is supposed to attain in three years the marketable size of 8 or 9 inches in diameter, while in five years a pair of shells may weigh five or six pounds, the extreme weight being 10 pounds. The centre for labor and supplies of the Queensland fishery is Singapore, this port being an excellent market for the shells, while more pearls probably change hands here than in any other place in the world, large quantities being purchased for the Chinese market, where there is an extensive demand for second-class pearls.

The pearl oysters live at depths of from 8 to 20 or more fathoms. For collecting the oysters small vessels of from 12 to 15 tons are most convenient. Two or more such boats are usually accompanied by a larger vessel as a storeship. The best divers are Japanese; Filipinos are also good, and Malays are employed. The diver takes with him a netted bag made of rope. When the depth is from 8 to 15 fathoms, the diver can work at the bottom for two or more hours, but at a greater depth he cannot remain on the bottom more than 15 minutes. The shells usually live in strong currents and in narrow channels between groups of islands, where they lie on a hard bottom.

The pearl fishery of the Mississippi and its tributaries is of much greater importance than is generally known. During recent years 1000 persons have been engaged in this industry on the Mississippi River alone. In 1901 a single firm is stated to have bought from these fishermen \$100,000 worth of pearls, besides the clam or mussel shells from which pearl buttons are made. It is said that the supply of pearls is not being exhausted, but that the demand has increased so rapidly since 1900 as to treble prices. The centre of the industry is Muscatine, Iowa.

The industry of mussel fishing has been greatly extended in the United States in recent years. A partial census of this industry in 1913 showed that mussel fishing was in progress in over 60 streams in the United States and indicated that the value of the product is now from \$2,000,000 to \$3,000,000 per annum. The value of the product of the rivers east of the Mississippi and north of the Ohio was \$546,471, of which \$164,271 was pearls, the remainder shells. The value of the product of the rivers south of the Ohio including those tributary to the Gulf of Mexico was \$443,727, of which \$149,121 was pearls. This does not include the chief field of this industry, the Mississippi River on the Iowa front-

age, of which the census was in progress in 1915. Certain available data on the relative production of the various areas seem to indicate that the Upper Mississippi industry about equals that of the two sections above described, and that the total value of the product of all mussel fisheries is from \$2,000,000 to \$3,000,000 per annum. This estimate is apparently justified by the fact that the value of the shells received by the pearl-button factories of the United States is over \$1,000,000 annually, about two-thirds of this being shells received by factories in Iowa and Illinois adjacent to the great mussel fisheries near Muscatine, Iowa. This, of course, does not include the pearls which form about one-third of the value of the products of the rivers east of the Mississippi. The total value of the pearl-button industry in the United States was, in 1912, \$8,882,000. The factories received, in 1912, \$1,107,742 worth of shells, chiefly from the streams of the United States, also \$2,385,000 worth of "blanks," of which approximately one-half were imported. The value of the investment in these factories was \$3,170,000; material purchased, \$3,504,000; product sold, \$8,882,471.

In the United States the fresh-water pearl industry dates back to 1857, when the "Queen Pearl" was found in New Jersey. It was sold to the Empress Eugénie for \$2500 and is said to be worth now four times that sum. Tennessee, Kentucky, and Wisconsin are the leading States in the pearl industry, and in the 10 years succeeding 1889 it is said that more than \$25,000 worth of pearls were collected in Wisconsin alone. So great has been the destruction of the mussels there that in many places they are nearly if not quite exterminated.

Bibliography. G. F. Kunz, *Fresh-Water Pearls and Pearl Fisheries of the United States* (Washington, 1898); Kunz and Stevenson, *Book of the Pearl* (New York, 1908); W. J. Dakin, *Pearls* (Cambridge, 1913). For extended accounts of the Ceylon pearl fisheries, consult: im Thurn and others in *Spolia Zeylanica* (Colombo, 1903, 1907, 1913); W. A. Herdman, *Pearl Fisheries of Ceylon* (Washington, 1905); also William Saville-Kent, *Great Barrier Reef of Australia: Its Products and Potentialities* (London, 1900); and for recent data on the fresh-water mussels of the United States, *United States Bureau of Fisheries, Documents 781, 793, 804* (Washington, 1914).

PEARL. A beautiful English poem belonging to the fourteenth century and probably to the second half of that century. It is a lament of a father for a lost child, symbolized by a pearl. The poem consists of 101 twelve-line stanzas. The dialect is West Midland. That the poet lived in the west of England near the Welsh borders is all that is known of him. Consult: Modern English versions by C. G. Osgood (Boston, 1906); Sophie Jewett (New York, 1908); W. H. Schofield, "Nature and Fabric of the Pearl," in *Modern Language Association, Publications*, vol. xix (Baltimore, 1904).

PEARLASH (so called on account of the color), or **POTASHES**. Crude potassium carbonate obtained from wood ashes. The commercial product is made in Canada, as follows: wood is burned in pits and the resulting ash spread on a stone floor, sprinkled with water, and worked till it is damp, frequently with the addition of a little lime. The damp ash is then placed in casks containing false bottoms, covered with

straw, and hot water poured over them. The liquid, which is drawn off from a plug hole at the bottom, is evaporated to dryness and finds some use in this condition as a manure owing to the soluble potash that it contains. The crude pearl ash thus obtained may be purified by dissolving in hot water and then cooling, during which the sulphate and chloride, together with the insoluble matter, separate, while the clear supernatant liquid is drawn off and boiled down until it crystallizes. When sufficiently pure this product finds use in the manufacture of flint glass. Ordinary pearlash is used principally, however, in the manufacture of soap.

PEARL HARBOR. An inlet on the south coast of Oahu, Hawaii, 6 miles west of Honolulu (Map: Hawaii, C 2). It consists of several landlocked basins with a narrow entrance inside of which there is a depth of 60 feet. Outside, however, a coral reef prevents the entrance of large vessels. In 1884 the United States obtained the right from the Hawaiian government to establish here a coaling and repair station, and several surveys were made by the United States government. The harbor, however, was not utilized under the independence of the Hawaiian Kingdom and the Republic which succeeded it up to the annexation by the United States in 1898. Since that event the Navy Department has prosecuted the improvement of the harbor and the opening of a channel through the reef on such a scale as to create here a naval base of the first order; the Army Department has kept even pace in the preparation of the shore defenses.

PEARLITE. See METALLOGRAPHY.

PEARLITE (so called on account of the pearly lustre). A glassy or once glassy rock which exhibits a ready separation by cracks into spherical or spheroidal forms. These so-called pearlitic cracks may arise from stresses set up during the cooling of the magma or from differential expansion and contraction about spherulitic masses of feldspar.

PEARL MICA. See MARGARITE.

PEARL MILLET. A cereal grain. See GUINEA CORN.

PEARL OYSTER. A tropical bivalve (*Meleagrina margaritifera*), noted for producing precious pearls and mother-of-pearl. See PEARL.

PEARL RIVER. A river of Mississippi. It rises in Winston County, flows in a generally southerly direction, and empties into the Rigolets, a connecting pass between Lake Borgne and Lake Pontchartrain (Map: Mississippi, F 9). The river is narrow and winding, but with a slight rise is navigable for light-draft vessels for 100 miles, while vessels of 8-foot draft can proceed as far as Gainesville, 15 miles from the mouth. The total length of the stream is about 300 miles. Its drainage basin includes about 7000 square miles.

PEARL WEDDING. See WEDDING ANNIVERSARIES.

PEARL WOOD NYMPH. See WOOD NYMPH.

PEARSE, pērs, ALFRED (?-). An English painter, wood engraver, and costume designer, also an author. He was born at St. Pancras, London, and studied wood engraving from 1872 to 1875. He first achieved fame as an illustrator, being special artist for the *Pictorial World* from 1879 to 1886 and for the *Sphere* on the royal colonial tour in 1901-03.

Among his best-known works are a miniature of Queen Mary, in possession of the King of England; eight pictures for the *Life of King George V*; and "The Opening Ceremony of the City Battalion, Royal Fusiliers." He was specially commissioned to sketch the coronation of King George and Queen Mary in Westminster Abbey, to paint 20 historical pictures for Burke's "Royal Historical Record," and to design costumes for various ceremonies. He is the author of *Fifty Thousand Miles under the Union Jack*, besides numerous stories and articles.

PEARSE, MARK GUY (1842-). An English clergyman and author. He was born at Camborne, studied medicine and then theology, and in 1863 entered the Wesleyan ministry. After holding various charges at Leeds, Brixton Hill, Ipswich, Bedford, Highbury, Westminster, Launceston, and Bristol Pearse was chosen (1889), on the motion of Hugh Price Hughes (q.v.), to take charge of the West London Mission, from which he retired after 14 years of service. His writings, numbering more than 25 volumes, include devotional works and semireligious tales, especially of Cornish life. The best known are: *Daniel Quorm and his Religious Notions* (1874-79), of which several hundred thousand copies were printed in many languages; *Elijah, the Man of God* (1891); *The Gentleness of Jesus* (1898); *The Story of a Roman Soldier* (1899); *West Country Songs* (1902); *Bridgetstown* (1907); *The Prophet's Raven* (1908); *Christ's Cure for Care* (1914).

PEARSON, per'son, CHARLES HENRY (1830-94). An English educator and historian, born at Islington, Sept. 7, 1830. He studied at Rugby, at King's College, London, and at Oriel College, Oxford, receiving a B.A. in 1853, a fellowship at Oriel in 1854, and an M.A. in 1856. In 1855 he was called to King's College as lecturer in English language and literature and after a short time was made professor of modern history. While holding this post he was a regular contributor first to the *Saturday Review* and later to the *Spectator*, until he became editor of the *National Review*. Threatened with blindness, he removed in 1871 to Australia, where until the recovery of his health he pursued the life of a sheep farmer. He subsequently became professor of modern history at the University of Melbourne, but soon resigned this chair to become head master of the Presbyterian Ladies' College. In 1878 he was elected a member of the Legislative Assembly of Victoria and eight years later became Minister of Public Instruction, a post which he held for eight years and in which he thoroughly reformed the educational system in the face of strong sectarian opposition. He returned to London in 1892 and died there May 29, 1894. His principal works are: *Russia, by a Recent Traveler* (1859); *History of England during the Early and Middle Ages* (2 vols., 1867); *English History in the Fourteenth Century* (1876); *Historical Maps of England during the First Thirteen Centuries, with Explanatory Essays, etc.* (1869); *National Life and Character: A Forecast* (1893; new ed., 1914), in which he attempts to show that the white race is doomed to ultimate domination by the black and yellow races; *Report on the State of Public Education in Victoria* (1878); *Reviews and Critical Essays*, edited by Strong (1896). Consult *Charles H. Pearson: Memorial by himself*,

his Wife, and his Friends, edited by William Stebbing (London, 1900).

PEARSON, CYRIL ARTHUR (1866-). An English newspaper proprietor, born at Wookey, Somersetshire. He began his career, after leaving Winchester School, as subeditor of *Tit-Bits*. After four years as manager of the Newnes publications (see *NEWNES, SIR GEORGE*) he started in business for himself, founding *Pearson's Weekly*, *Home Notes*, *Pearson's Magazine*, the *Lady's Magazine*, and other periodicals. An important step in his career was taken in the launching of the *Daily Express* as a halfpenny paper in 1900. Five years later he secured control of the *Standard* and next of the *St. James's Gazette*. His newspaper proprietorship extended until he owned a chain of influential journals in various British cities. In 1903 he became vice president of the Tariff Reform League and vice chairman of the Tariff Commission. Pearson was also prominent in philanthropic work.

PEARSON, JOHN (1613-86). An English prelate of high celebrity. He was born on February 28 at Great Snoring in Norfolk. He was educated at Eton and King's College, Cambridge, where he took the degree of M.A. in 1639, and in the same year took orders and was collated to a prebend in Salisbury Cathedral. In 1640 he was appointed chaplain to Sir John Finch, Lord Keeper of the Great Seal, and on the outbreak of the Civil War became chaplain to Lord Goring, and afterward to Sir Robert Coke, in London. In 1654 he was appointed minister of St. Clement's, Eastcheap, London, and in 1659 published the great work by which he is now remembered and which has been republished many times, *An Exposition of the Creed* (new ed., 2 vols., 1890-91). During the same year Pearson published *The Golden Remains of the Ever Memorable Mr. John Hales of Eton*. At the Restoration honors and emoluments were lavishly showered upon him. Before the close of 1660 he received the rectory of St. Christopher's in London, was created D.D. at Cambridge, installed prebendary of Ely and Archdeacon of Surrey, and made master of Jesus College, Cambridge. In 1661 he obtained the Margaret professorship of divinity and was one of the most prominent commissioners in the Savoy Conference; in 1662 he was made master of Trinity, Cambridge, and in 1673 was consecrated Bishop of Chester. In 1672 he published his *Vindiciæ Epistolæ S. Ignatii*, in answer to Daillé, who had denied the genuineness of the Epistles. In 1684 appeared his *Annales Cyprianici*. He died at Chester, July 16, 1686. Pearson's *Opera Posthuma Chronologica* were published by Dodwell (London, 1688, 3 parts), and his *Orationes, Concioniones et Determinationes Theologicæ* contain much valuable matter. Consult Churton's memoir prefixed to Pearson's *Minor Theological Works* (2 vols., Oxford, 1844) and S. Cheetham, "John Pearson," in A. Barry, *Masters in English Theology* (London, 1877).

PEARSON, JOHN LOUGHBOROUGH (1817-97). An English architect, born in Brussels. He studied under Bonomi in Durham and in London with Salvin and Hardwick, entered practice for himself in 1843, and built churches in Yorkshire (1843-46). A second period, following the construction of Holy Trinity for Archdeacon Bentinck (1850), was largely devoted to restorations of old churches, including ex-

tensive repairs to Lincoln Cathedral and important work at Canterbury, Rochester, Peterborough, Chichester, Bristol, and Exeter. His most widely known work of restoration was that of the north transept of Westminster Abbey. In 1879, having received a gold medal and the cross of the Legion of Honor at Paris in the previous year, he was intrusted with the plans for the new cathedral at Truro, which may be reckoned his greatest opportunity and his best work. For the most part his architectural type was ecclesiastical and Gothic, but he essayed some country houses and office buildings and at times used the Tudor, Jacobean, or Free Renaissance.

PEARSON, KARL (1857-). An English physicist and sociologist. He was educated at King's College, Cambridge, studied at Heidelberg and Berlin, and was called to the bar in 1882. After two years (1882-84) as professor of geometry he was appointed to a chair of applied mathematics and mechanics in University College, London. In 1911 he became Galton professor of eugenics and director of the laboratory for national eugenics at the University of London. His point of view is outlined under **EUGENICS**. Pearson received the Darwin medal from the Royal Society in 1898. Besides editing *Biometrika*, vols. i-viii (1902-11), he wrote: *History of the Theory of Elasticity and Strength of Materials* (1886-93); *The Ethic of Freethought* (1888; revised 1901); *Grammar of Science* (1892; 3d ed., revised, 1911); *The Chances of Death, and Other Studies in Evolution* (1897); *National Life from the Standpoint of Science* (1901); *The Life, Letters, and Labors of Francis Galton* (1914).

PEARSON, WEETMAN DICKINSON. See **COWDRAY OF MIDHURST, W. D. P., BARON.**

PEARSONS, DANIEL KIMBALL (1820-1912). An American physician, real-estate owner, and philanthropist, born at Bradford, Vt. He attended Dartmouth College for one year, taught for a time, and graduated from the medical school at Woodstock, Vt., in 1842. After practicing his profession at Chicopee, Mass., until 1857, he moved West, settling finally at Hinsdale, Ill. Pearsons afterward gave his attention entirely to the development of real estate in and near Chicago and made a great fortune, particularly by rebuilding after the Chicago fire. In 1873 he retired, although he continued director of numerous corporations. His wealth aided more than 40 colleges, the sums given aggregating about \$4,000,000. He required in each instance that a larger amount be raised from other sources before his gift should become available. Most of the institutions selected were located in the West and South.

PEARY, pe'ri, JOSEPHINE DIEBITSCH (Mrs. ROBERT E. PEARY) (?-). An American Arctic traveler, born in Washington, D. C. She was married to Mr. Peary in 1888, and accompanied her husband on his expeditions of 1891-92 and 1893-94 to his winter quarters in Greenland. Here was born their daughter Marie Ahnighito (snow baby), the first white child to be born so far north. Mrs. Peary again accompanied her husband in 1897, and she went north to meet him in 1900 and again in 1902. She is author of *My Arctic Journal* (1894); *The Snow Baby* (1901); *Children of the Arctic* (1903).

PEARY, ROBERT EDWIN (1856-). An American Arctic explorer, discoverer of the

North Pole. He was born at Cresson, Pa., May 6, 1856, graduated from Bowdoin College, Maine, in 1877, became a civil engineer in the United States navy in 1881, and in 1884-85, under government orders, was assistant engineer on the route of the proposed Nicaragua Ship Canal. In 1887-88 he was engineer in chief of the Nicaragua Canal Survey. He was married in 1888 to Josephine Diebitsch. (See **PEARY, JOSEPHINE DIEBITSCH.**) His first expedition to the Arctic was merely a reconnaissance in 1886 of the Greenland inland ice cap east of Disco Bay, in lat. 70° N. From this time until he sailed in 1891 on an expedition to northwest Greenland all his leisure was given to detailed studies and preparations for his participation in Arctic research. During this expedition (June, 1891-September, 1892) he made a brilliant record of achievements, not the least of which was that he reduced to a science the problems of equipment. His journey over the inland ice, from 5000 to 8000 feet above the sea, from McCormick Bay to the northeast angle of Greenland (Independence Bay, lat. 81° 37' N.), a round trip of 1300 miles (including land travel on the northeast coast), was one of the most brilliant feats of polar sledge work ever accomplished. He proved that the northern extension of the great interior ice cap ends below lat. 82° N. He also established the insularity of Greenland and ascertained the existence of detached ice-free land masses north of the mainland and the fact that the east and west coasts rapidly converge north of the seventy-eighth parallel. His ethnological work among the Eskimos known as the Arctic Highlanders (from Cape York to Smith Sound) was the most thorough and noteworthy that had been done in that region. The auxiliary expeditions in which well-known men of science participated gave opportunity for fruitful researches as to glacial and other Arctic phenomena. In 1893-95 Peary made another voyage to the same region, completed his study of the Arctic Highlanders, made a second journey across the ice cap to Independence Bay, and discovered the Eskimos' famous meteorites near the coast of Melville Bay. These were removed to New York in Peary's summer voyages of 1896 and 1897 and in 1909 became the property of the American Museum of Natural History, New York. One of them, weighing 90 tons, is the largest known to exist. Again in 1898 the explorer started north, intending to outline the northern extension of the land masses above Greenland and to reach the North Pole if possible. His work covered four years, during which he made resurveys of a considerable extent of coast line in the neighborhood of Smith Sound, surveyed new coast lines on the west side of Grinnell Land and north of the Greenland mainland, and made a number of notable and very difficult sledge journeys along the northern channels leading to Lincoln Sea. Passing Lockwood's (q.v.) farthest, he traced the northern limit of the land masses north of Greenland to its highest point, 83° 39' N., and then followed the southerly trend of the coast for many miles towards Independence Bay on the east coast.

In the spring of 1902 Peary started over the Arctic Ocean from Cape Hecla, on the north coast of Grant Land, in an attempt to reach the North Pole. At his farthest camp in lat. 84° 17' N. the polar pack became impracticable

and further efforts to advance were given up. In the summer of 1905 he led another expedition, in the ship *Roosevelt* (especially constructed for Arctic exploration), and in the following summer reached $87^{\circ} 6'$, the nearest approach to the North Pole up to that date. It was in July, 1908, that Peary turned to the last great task of his life. For 30 years he had been preparing for it. He had spent a longer period in North Greenland than any other explorer, had lived through more winters, had mapped a larger area. He had suffered severely. The amputation of part of one foot had lamed him for the rest of his life. At 52 he was older than had been other great explorers at the height of their achievement (Franklin 46, Mackenzie 42, Parry 37, McClure 47, Greely 37). Long years of exposure had had their inevitable effect, but he had the supreme advantage of experience, of skill, of courage and capacity for endurance, of enthusiastic and able assistants, and of Eskimo acquaintance and confidence. At Etah were well-equipped, trained natives who owed him everything.

On his final expedition, Peary left New York on the *Roosevelt* July 6, 1908. Robert A. Bartlett (q.v.) was master of the vessel, George A. Wardwell was chief engineer, Dr. J. W. Goodsell was the surgeon, and there were the following assistants: Ross G. Marvin, Donald B. MacMillan, George Borup, and Matthew A. Henson, a negro. Etah was reached August 11. A week later, having taken on 22 Eskimo and 246 dogs, and with renewed supplies of coal and fresh meat, the *Roosevelt* started for Cape Sheridan. Here winter quarters were established September 8, at a point a little north of that selected in 1905. Sledge work over a wide area extended geographical knowledge and in February the work of establishing a chain of depots began. As a base Peary had taken the land mass thought to be nearest the Pole. Seven members of the party on the *Roosevelt* (as named above), 17 Eskimo, 133 dogs, and 19 sledges (some of the improved Peary type) made up the strongest and best-organized expedition that had ever set out to attain the farthest north possible. In an unusual degree the men were familiar with and prepared for the conditions they would meet.

Upon leaving the *Roosevelt* behind, Peary set out for Cape Columbia and from there began the march over the ice of the Arctic Ocean, March 1. Within three days the party reached the "big lead," a strip of water of fluctuating width marking the continental shelf. This did not close up so that it could be crossed until March 11. From here ($84^{\circ} 29' N.$ Lat.) that section of the party which could best be spared returned, commanded by Dr. Goodsell. In five marches $85^{\circ} 23'$ was reached, and thence the second section, led by Borup, returned. The leader started on with 12 men, 10 sledges, and 80 dogs. Marvin, who was drowned on the return, went back from $86^{\circ} 38'$, and Bartlett, with the fourth, from $87^{\circ} 48'$. This was the farthest north attained to that time. The commander now had with him only Henson (the negro assistant), four Eskimo, and the pick of his dogs (40 in number). The 125 miles of the final dash were covered in five days' marches of equal length, $89^{\circ} 57'$ was reached April 6. But on this day, when actually within sight of the Pole, Peary records that he was so exhausted he could go no farther. The next day the few

remaining steps were taken and observations were made—13 single or $6\frac{1}{2}$ double altitudes of the sun at two different stations.

After remaining at the Pole 30 hours, the party started back. The return proved more perilous than the advance. Soundings showed that the party had traveled over ice on an ocean more than 1500 fathoms deep (the wire was exhausted at this point). Moreover, the clear weather disappeared and a north-northeast gale caused serious delay and raised the peril of opening leads. To the east Peary saw masses which he named Crocker Land. Although this land was reported nonexistent by MacMillan when later he made a search for it, Stefansson's (q.v.) observations (reported 1915) showed land beyond and tended to substantiate Peary's claim. The return to Cape Columbia was made in 16 marches and the *Roosevelt* reached Indian Harbor September 5. After his return to the United States, Peary was involved in a bitter controversy with Dr. Frederick A. Cook (q.v.), who claimed to have reached the Pole first by nearly a year. Various honors came to Peary. He received gold medals from various geographical societies, was promoted to rear admiral and received the thanks of Congress (1911), and in 1913 was made Grand Officer of the Legion of Honor of France. From 1901 to 1906 he served as president of the American Geographical Society and in 1904 of the Eighth International Geographical Congress. He is author of *Northward over the Great Ice* (2 vols., 1898); *Snowland Folk* (1904); *Nearest the Pole* (1907); *The North Pole* (1910). Consult Peary's own writings, the periodicals for the years during which he was making his expeditions, and H. L. Bridgman, in *American Geographical Society Journal*, vols. xxxii-xxxiii (New York, 1900-02).

PEARY LAND. A name given to the northernmost coasts of Greenland, which were discovered by Lockwood and Brainard in 1882, under the name of Hazen Coast, and later materially extended by the explorations of Peary in 1892 (Map: Arctic Region, G 5).

PEASANT WAR (OF. *paissant*, Fr. *paysan*, from OF. *païs*, *pays*, Fr. *pays*, country, from Lat. *pagus*, district, province, from *pangere*, to fix, to fasten; connected with *pax*, peace, Gk. *παγνύειν*, *pēgnynai*, to fasten, and perhaps with Goth., OHG. *fahan*, AS. *fon*, Ger. *fangen*, to seize, take). The name given to the insurrection of the peasantry in central and south Germany in the year 1524-25. With the decline of the feudal system the lot of the peasantry throughout Germany had greatly deteriorated. They were still subject to the oppressive exactions of their feudal masters, but the ancient service of protection from master to man had gradually disappeared. The majority of the peasants were the Hürige, a class personally free but subject to onerous dues and services; many were Leibeigene, or serfs, whose dues and services were not limited by law and custom, but were entirely at the will of the lord. The example of Switzerland encouraged the German peasants to hope that the yoke of the nobility might be thrown off, and after 1475 there were risings here and there among the peasants of south Germany. A peasant league rose in the Rhine countries in 1502 and another was organized in Württemberg in 1514, but both were put down. The great insurrection finally broke out in Swabia in June, 1524. An irregular warfare ensued, attended by the most revolting cruelty

on both sides. In spite of the disadvantage under which the ignorant and poorly organized peasants labored, the insurrection spread through Alsace and the Palatinate, Franconia, Bavaria, Tirol, and Carinthia. The rising of the peasants was accompanied by insurrections among the lower classes in many cities. The movement in many parts took on a religious character and was merged with the agitation of the Anabaptists (q.v.), Thomas Münzer (q.v.) becoming one of the principal leaders of the peasantry. The demands of the peasants were set forth in a manifesto, known as the Twelve Articles, issued about Easter, 1525, by the insurgents of Swabia. These embraced the free election of their parish clergy; the appropriation of the tithes of grain, after competent maintenance of the parish clergy, to the support of the poor and to purposes of general utility; the abolition of serfdom and of the exclusive hunting and fishing rights of the nobles; the restoration to the community of forests, fields, and meadows, which the secular and ecclesiastical lords had appropriated to themselves; release from arbitrary augmentation and multiplication of services, duties, and rents; the equal administration of justice; and the abolition of some of the most odious exactions of the clergy. The conduct of the insurgents was not, however, in accordance with the moderation of their demands. Their many separate bands destroyed convents and castles, murdered, pillaged, and were guilty of the greatest excesses, partly in revenge for the cruelties practiced against them. A number of princes and knights were forced to make common cause with them and even to join their ranks, the most noted of these being Götz von Berlichingen (q.v.). Luther (q.v.) denounced the excesses of the peasants and called upon the princes of Germany to stamp out the insurrection. The peasant army in central Germany, under the command of Münzer, was overwhelmed at Frankenhausen, on May 15, 1525, by the Landgrave Philip the Magnanimous of Hesse, at the head of the forces of Hesse, Saxony, and Brunswick. By June disorderly bands in south Germany had been mostly annihilated or dispersed. The peasants, after they had been subjugated, were everywhere treated with terrible cruelty. Multitudes were hanged in the streets and many were put to death with the greatest tortures. It is supposed that more than 100,000 persons lost their lives in the Peasant War. Flourishing and populous districts were desolated. The lot of the defeated insurgents became harder than ever, and it was not till the beginning of the nineteenth century that the burdens of the peasantry were made lighter.

Bibliography. C. A. Cornelius, *Studien zur Geschichte des Bauernkriegs* (Munich, 1862); Janssen, *Geschichte des deutschen Volks seit dem Mittelalter* (Freiburg, 1877-94); Stern, *Die Sozialisten der Reformationszeit* (Berlin, 1883); Fries, *Geschichte des Bauernkriegs in Ostfranken* (Würzburg, 1884); Zimmermann, *Allgemeine Geschichte des grossen Bauernkriegs* (new ed., Stuttgart, 1891); F. L. Baumann, *Die zwölf Artikel* (Kempten, 1896); K. Kautsky, *Communism in Central Europe in the Time of the Reformation* (London, 1897); E. B. Bax, "The Peasants' War in Germany, 1525-26," in *The Social Side of the Reformation*, part ii (ib., 1899); J. S. Schapiro, *Social Reform and the Reformation* (New York, 1909).

PEAS'LEE, EDMUND RANDOLPH (1814-78). An American physician. He was born in Rockingham Co., N. H., and in 1836 graduated from Dartmouth College, where he remained for two years as tutor. After taking his medical degree at Yale in 1840 he began practice in Hanover, N. H., in 1841. In 1842 he became professor of anatomy and physiology at Dartmouth. He was made professor of physiology and pathology in the New York Medical College in 1851, and in 1858 he assumed the chair of obstetrics and removed to New York City. In 1874 he was made professor of gynecology in Bellevue Hospital Medical College. He published *Human Histology* (1857) and *Ovarian Tumors* (1872).

PEAT (possibly a variant of *beat*, sod, from *beet*, AS. *bētan*, to mend, from *bot*, Goth. *bōta*, OHG. *buoza*, Ger. *Busse*, reparation). The product resulting from the partial decay of vegetable matter—mosses and other marsh plants—which grows and dies in boggy places where water stands. In the northern parts of the world the peat-forming vegetation consists largely of various species of *Sphagnum* (q.v.), or bog moss. In the Southern Hemisphere, on the other hand, no moss seems to enter into the bog vegetation, South American peat being formed, according to Darwin, from many plants, but chiefly a rush, *Astelia pumila*. The vegetation is found in different stages of decomposition at different depths in the peat. In the surface layer the fibre of the plants is often so well preserved that it has been successfully used to some extent as a textile and for paper making. The decomposition increases with the depth until the peat in many cases finally and by insensible degrees passes into a lignite-like mass. The less perfectly decomposed peat is generally brown; that which is more completely decomposed is often nearly black.

Moist peat possesses a decided antiseptic property. This is shown not only in the perfect preservation in bogs of trees, leaves, fruits, etc., but sometimes also of animal bodies. On account of this antiseptic property peat is not well suited for use as a fertilizer in the raw state, but should be allowed to weather before being so used.

In warm regions the decay of vegetable matter is as a rule too rapid to permit the formation of the very extensive peat deposits found in cooler parts of the world and such deposits as occur are more advanced in decomposition. The rate of growth of peat deposits under favorable conditions is variously estimated at from 2 to 4 inches a year. Many thousands of acres of peat occur in north Germany. In Ireland the lowland bog area is estimated at about 1900 square miles and the highland at about 2400 square miles. Russia is said to have 67,000 square miles of peat. Several million acres occur in Norway and Sweden, France, Austria, Denmark, and Holland. Canada is stated to have 37,000 square miles of workable peat bogs (5 to 6 feet deep). It has been estimated that the United States, exclusive of Alaska, is capable of yielding 12,868,500,000 tons of peat. The peat beds of Alaska are very extensive and the peat has been shown to have a high fuel value.

Peat has probably been more systematically and generally utilized in Holland than in any other country, and peat moss for litter and for potting plants forms an important item of ex-

port from that country (10,983 tons in 1913). Other European countries, however, have given considerable attention to the utilization of peat and the reclamation of peat lands. The peat deposits of the United States are comparatively little used commercially, although peat fertilizer filler and drier is now manufactured to the extent of probably 30,000 tons annually and a small amount is being used in the manufacture of cattle food (peat molasses).

Peat was formerly used extensively as a fertilizer, particularly in the form of compost (q.v.), but its use has declined since the general introduction of the more convenient and efficient commercial fertilizers. (See MANURES AND MANURING.) Its principal use as a fertilizer is as a fertilizer filler and drier. Its fertilizing value is not so high as its percentage of nitrogen would indicate, because this nitrogen is in a very unavailable form. Dried peat, and especially peat moss, is an excellent absorbent and is used to a considerable extent as a litter in stables with very satisfactory results. Müntz and Lainé showed that peat can be used with great advantage in filter beds for sewage purification. It is also used to some extent (4800 tons in 1913) in the United States (as already stated) and to a considerable extent abroad in the manufacture of so-called peat molasses, a cattle food prepared by mixing the crude molasses from sugar factories with dried ground peat.

Peat is used to a considerable extent for fuel in certain countries, particularly Ireland, Holland, Germany, and the Scandinavian countries. For this purpose the more perfectly it is decomposed, and therefore the more consolidated it is, the better. For this reason in cutting peat for fuel it is the practice to remove the partially decomposed surface layer and use only the lower and more completely decomposed layers. Since peat is a light and bulky material it cannot be profitably transported great distances. Efforts have therefore been made with varying success to render it more generally useful by compressing it into briquettes of a specific gravity nearly equal to that of coal. The compressing of peat has, however, not yet assumed very great commercial importance. The Canadian government is making a special effort to encourage the use of peat fuel and to this end maintains an experimental peat fuel making plant and testing station. A process for making a dry peat powder fuel has recently been introduced in Sweden, and it is stated that the fuel is being used successfully in railway locomotives and stationary boiler furnaces.

Charcoal prepared from peat is valuable for many purposes. That made from uncompresssed peat is very light and inflammable, but is particularly useful as an antiseptic and deodorizer. That made from compressed peat is superior in density to wood charcoal and is capable of being used as coke. Peat charcoal is highly esteemed for the smelting of iron and for working and tempering the finer kinds of cutlery.

Various attempts have been made to obtain valuable products from the destructive distillation of peat, and various processes have been devised for the manufacture of ammonia, nitrates, and gas from peat, but none of these has yet become of great commercial significance. See COAL; Colored Plate of MUSCI.

Bibliography. Johnson, *Peat and its Uses as Fertilizer and Fuel* (New York, 1866);

Koller, *Die Torf Industrie* (Leipzig, 1898); Bach, "Peat," in *The Mineral Industry*, vol. vii (New York, 1899); Heinrich Ries, "Peat," in *United States Geological Survey, Report, 1901* (Washington, 1902); F. T. Gissing, *Facts about Peat* (Boston, 1904); Kerr, *Peat and its Products* (Glasgow, 1905); Björling and Gissing, *Peat: Its Use and Manufacture* (Philadelphia, 1907); F. T. Gissing, *Commercial Peat: Its Uses and Possibilities* (ib., 1910); Charles A. Davis, "The Uses of Peat," *United States Department of Interior, Bureau of Mines, Bulletin 16* (Washington, 1911); also publications of the United States Geological Survey and of the Canada Department of Mines.

PEAT BOG. See SWAMP.

PEA TREE. See PEPPER TREE.

PEAUCELLIER'S (pô'sèl'yáz') **CELL.** See LINKAGES.

PEAU DE CHAGRIN, pô de shá'grän' (Fr., Asses' Skin). A tale by Balzac (1831), in which the hero, Raphaël, is the possessor of a piece of ass's skin having the magic power of fulfilling material wishes, but diminishing in size each time the power is exercised, and associated with a corresponding shortening of the possessor's life.

PE'BA (South American Indian name). A small armadillo (q.v.). In Texas and Mexico the name is given to the nine-banded armadillo (*Tatusia novemcincta*), which is about 30 inches long and is notable as the only edentate that occurs in the United States. In South America the name is sometimes given to armadillos of the genus *Dasypus*.

PEBAN, pâ'ban. A linguistic stock of the Marañón region, South America, on the Río Javary. According to Brinton dialects of this stock are spoken by the Caumaris, Cauwachis, Pacayas, Yeguas, Yaguas, or Yahaus. These Indians have been called by M. Ordinaire "the most perfect physical type of all the Indian races." Consult: Olivier Ordinaire, "Les sauvages du Pérou," in *Revue d'Ethnologie* (Paris, 1887); D. G. Brinton, *The American Race* (New York, 1891); A. F. Chamberlain, in *Journal de la Société des Américanistes de Paris*, N. S., vol. vii (Paris, 1910).

PÉBRINE, pâ'brên'. A disease of silkworms. See SILKWORM.

PEC. See IPEK.

PECAN, pê-kän' or pê-kän' (probably from the North American Indian name), *Carya pecan.* (Formerly called *Hicoria pecan.*) The common name of an American forest tree, 75 to 170 feet high, and its fruit, a nut. (For the botany of the pecan and its forestry value, see HICKORY.) The tree is native to river bottoms from Iowa and Indiana southwest into Texas and Mexico, but is now grown commercially in a number of southeastern States and in California. It has not proved commercially successful north of lat. 40°.

The trees grow on nearly all soils, but for nut production a sandy loam soil with a clay subsoil has proved most satisfactory in the Southern States. The trees should be set about 40 feet apart. Clean orchard cultivation should be practiced. Through cultivation and selection a number of varieties have been originated, which, since they do not come true to seed, are budded or grafted upon seedling stocks. Little pruning except the removal of dead limbs is required after the head has been formed. The trees come into bearing in five or six years,

but paying crops cannot be expected under 10 years, and full crops not under 20. Mature trees sometimes yield as high as 20 bushels of nuts each, but two to three bushels per tree is probably a good average. The nuts have a rounded oblong shape and vary in weight from 25 to 100 to the pound. The varieties called paper shells are considered most desirable, because their shells are very thin and are easily cracked between the fingers. The meats are large and separate easily from the shell. At the present time Texas, Oklahoma, Louisiana, Mississippi, Georgia, and Florida furnish the bulk of the commercial nuts, mostly from native trees. Consult H. H. Hume, *The Pecan and its Culture* (2d ed., Glenn St. Mary, Fla., 1910), and Reed, "The Pecan," in *United States Department of Agriculture, Bulletin No. 251* (Washington, 1912).

PÉCAUT, pā'kô', FÉLIX (1828-98). A French educationalist, born at Salies de Béarn. He was educated for the Church, but after a few years gave up this profession, publishing his religious views as *Le Christ et la conscience* (1859). Thereafter he devoted himself to education, at first in private schools and then as an inspector in the public service, to which he was appointed by Jules Ferry. His educational ideas he set forth in letters to the press and in *Etudes au jour de jour sur l'éducation nationale* (1871-79). His most successful undertaking was the organization of the girls' normal school at Fontenay-aux-Roses, the directorship of which he held for 15 years. Among further writings by Pécaut are: *L'Esprit de Fontenay* (1895), *L'Éducation et la vie nationale* (1897), and a posthumous volume, issued by his sons, *Quinze ans d'éducation*. Consult G. Compayré, *Félix Pécaut et l'éducation de la conscience* (Paris, n. d.).

PEC/CARY (probably from the South American Indian name) A small wild hog of the warmer parts of America, several species of which, of the genus *Dicotyles*, or, as it has recently been divided, the genera *Pecari* and *Tayassu*, represent the swine (Suidæ) in the New World, or, in the view of some, constitute a separate family, *Dicotylidæ*, or, better, *Tayassuidæ*. They differ from typical swine in having a mere tubercle instead of a tail; no external toe on the hind feet; and the tusks short and not curved outward. A gland opening on the

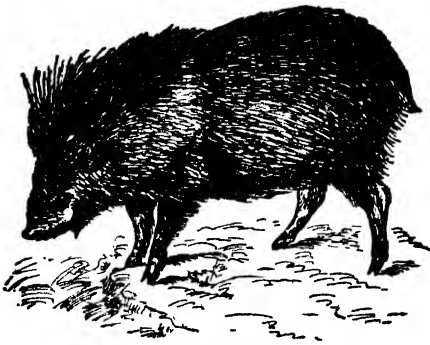
or *Pecari angulatus*), is found in almost all parts of South America and north through Mexico to Texas and Arkansas; the white-lipped peccary (*Dicotyles labiatus*, or *Tayassu pecari*) lives in Guiana, Brazil, Paraguay, and Peru. Both species are gregarious, the white-lipped peccary often assembling in very large herds and sometimes doing great mischief to maize and other crops, which are attacked at night, when the animals do all their feeding. The common peccary chiefly frequents forests, and small companies sometimes take up their abode in the hollow of a great tree. It is about the size of a small hog, grayish, bristly, and maned. A narrow white collar encircles the neck. The white-lipped peccary is considerably larger, of a darker color, with conspicuously white lips. Both species are capable of being tamed, but are of irritable and uncertain temper. In a wild state they defend themselves vigorously against assailants, making good use of their sharp tusks, a whole herd combining for defense. Their most dreaded enemy is the jaguar, or in the north the puma, which seizes one when it can be caught alone, but hurries into a tree to escape the onslaught of a herd. Human hunters have less to fear from them, judging by the Texas examples, than old stories would indicate. Peccaries are omnivorous, and, if hurtful to crops, render service by destroying reptiles. Their voice is somewhat like that of the hog, but more sharp. Their flesh is inferior to domestic pork. Consult Audubon and Bachman, *Quadrupeds of North America* (New York, 1841), and Alston, in *Biologia Centrali-Americana: Mammals* (London, 1879).

PÊCHEURS DE PERLES, pā'shēr' de pērl, Les. An opera by Bizet (q.v.), first produced in Paris, Sept. 30, 1863; in the United States, Jan. 11, 1896 (New York).

PECHILI, or **PECHIHILI**, pā'chē'lē'. An old name for the province of China which is now known as Chili, which means "direct rule" and is so called because it is the one in which is situated the capital (Map: China, L 3). The name Pechili is in frequent use by foreigners outside of China and on maps, but is not used by the Chinese themselves.

Chili is the most northerly of the six maritime provinces of China proper. It now includes within its jurisdiction a portion of inner Mongolia lying north of the Great Wall, where many Chinese have settled. Area, 115,800 square miles, nearly half of which lies beyond the wall.

With the exception of a number of scattered ridges of moderate height in its western and northern parts, the entire province is a plain formed by delta deposits. It is well watered by the Pei-ho (q.v.) with its numerous tributaries and their many feeders and by the Lan-ho, which rises in Mongolia and, like the Pei-ho, flows into the Gulf of Pechili. It is also traversed from southwest to northeast by the Yun-liang-ho, or Grand Canal, which terminates at Tientsin. There are three lakes in the centre of the province and several lagoons elsewhere. The province is rich in minerals, especially in coal, which has long been worked by the natives and is now mined by modern methods at Kaiping (q.v.). Iron is also plentiful, and silver has been found in several places. In the hills are great quarries of granite, marble, white saccharoid, and blue limestone. Except along the shores, where there are alkaline exu-



THE COLLARED PECCARY.

loins near the tail secretes a fetid humor, and must be cut out immediately after killing a peccary, or the flesh will be tainted. The common collared peccary, or tajaçu (*Dicotyles torquatus*,

datations, the soil is fertile and produces good crops of wheat, barley, millet, maize, cotton, tobacco, indigo, etc. The production of rice is not great; it is grown chiefly in the vicinity of the lakes. The climate is extreme, the temperature ranging from 8° below zero F. in winter to 95° F., 100° F., and at times 108° F. in summer. The chief outlet for commerce is the Pei-ho, and Tientsin was the only treaty port until Dec. 15, 1901, when the port of Chinwangtao, near the end of the Great Wall (which had been seized by the foreign admirals operating against the Boxers in 1900 and improved by them), was thrown open to foreign trade. This has a wooden pier 2000 feet long, at which vessels drawing 16 feet can unload. The roads are very poor, but railways have been introduced and under foreign competition are extending rapidly. The province is well supplied with postal and telegraph communications. There are 20 lines of telegraph radiating from Peking to every part of the country.

For administrative purposes Chili is divided into 11 fu or departments, 6 chiehchow or sub-departments, each subdivided into a certain number of prefectures, with the rank of ting, chow, or hien (or hsien). At the head of the government is a governor, with the usual corps of provincial officials, all of whom reside at the capital, Paotingfu (q.v.). Since the opening of Tientsin to foreigners, however, the Governor finds it convenient to spend most of his time there. Of the 11 fu one called Shuntien is detached from the jurisdiction of the provincial government. Its chief city, Shuntienfu, is the seat of the national capital and is best known as Peking. The officer who rules the Department of Shuntienfu resides here. The population of the province is estimated at 20,000,000 by the customs estimate (1910) and at 32,571,000 by the Chinese Michengpu census of the same year. The customs estimate is probably nearer the correct number.

PECHLIN, pěk'lén, KARL FREDRIK (1720-96). A Swedish politician, born in Hölstein and educated in Sweden. He entered the army and was advanced to the rank of major general (1770). In politics he worked against the Hats in 1760, but came over to their side a year later. In 1769 he again joined the opponents of the Hats. Gustaf III's revolution in 1772 put a quietus on his activities, but in 1786, when the opposition became strong, he eagerly joined it. For some time he was imprisoned (1789), and in 1792 he was charged with participating in the murder of Gustaf III. Evidence lacking, he was kept in detention at Varberg's Fort, where he died. See SWEDEN, *History*.

PECHT, pëkt, FRIEDRICH (1814-1903). A German painter, illustrator, and art critic, born at Constance. He was at first occupied for some years as a lithographer in Munich, then went to Paris in 1839 to study painting under Delacroix, and subsequently worked in Munich, Dresden, Leipzig, Frankfurt, and London on portrait and genre pictures. A sojourn in Italy (1851-54) was devoted chiefly to art-historical studies, the results of which he embodied in *Sudfrüchte, Skizzenbuch eines Malers* (1853). Settled in Munich, he became favorably known through a series of scenes from the lives of Goethe and Schiller, but more especially through his illustrations for the *Schiller-Galerie* (1855-59), *Goethe-Galerie* (1861-62), *Lessing-Galerie*

(1866-68), and *Shakespeare-Galerie* (1870-76). For these publications he also supplied the text. He painted frescoes in a hall of the Maximilianeum at Munich and in the council chamber at Constance. His publications include: *Deutsche Künstler des neunzehnten Jahrhunderts* (1877-85); *Geschichte der münchener Kunst im neunzehn Jahrhundert* (1888); *Aus meiner Zeit: Lebenserinnerungen* (1894); and he edited *Die Kunst für Alle* (Munich, 1885 et seq.).

PECK (perhaps from *peck*, *pick*, AS. *pycan*, Icel. *pikka*, to pick, prick). A measure of capacity for dry commodities, such as grain, fruit, etc., used in America, and equivalent to one-fourth part of a bushel (q.v.), or 537,605 cubic inches. It thus contains eight dry quarts. See WEIGHTS AND MEASURES.

PECK, ANNIE SMITH (?-). An American mountain climber, also a classical scholar. She was born in Providence, R. I., graduated from the University of Michigan in 1878, and, after studying in Germany and at the American School of Classical Studies at Athens, taught in preparatory schools and was professor of Latin at Purdue University and Smith College. In 1895 Miss Peck ascended the Matterhorn, in 1897 Popocatepetl and Orizaba in Mexico, and in 1900 Fünffingerspitze (Tirol). Her subsequent and most notable feats in mountaineering were performed in South America. She reached a height of 20,500 feet on Mount Sorata (Bolivia) in 1904, and four years later attained the summit of the north peak of Huascarán (Peru), an altitude of 21,812 feet, 1500 feet higher than Mount McKinley. In 1911, in the first ascent of the two peaks of Mount Coropuna, Peru, her record was 21,000 feet. The government of Peru presented Miss Peck with a gold medal and the United States sent her as official delegate to the International Congress of Alpinism at Paris in 1900. She is author of *A Search for the Apex of America* (1911) and *The South American Tour* (1913).

PECK, CHARLES HORTON (1833-). An American botanist. Born at Sand Lake, N. Y., he graduated from Union College in that State in 1859 and then taught in the Sand Lake Collegiate Institute and the Albany Classical Institute until 1867. After the latter year he had charge of the botanical department of the New York State Museum and after 1883 was State botanist. His publications include: *Boleti of the United States* (1889); *Mushrooms and their Use* (1897); *Plants of North Elba, Esser County, N. Y.* (1899).

PECK, GEORGE (1797-1876). An American Methodist Episcopal clergyman, brother of Jesse T. Peck. He was born at Middlefield, N. Y., joined the Genesee conference of the Methodist Episcopal church in 1816, was appointed presiding elder of the Susquehanna district in 1824, was principal of Cazenovia Seminary from 1835 to 1840, and in the last year was elected editor of the *Methodist Quarterly Review*, which position he filled for eight years. In 1848 he was elected chief editor of the *Christian Advocate and Journal*, in New York, retaining the position for four years. He was delegate to the First Evangelical Alliance in London (1846); pastor at Wilkes-Barre, Scranton, Providence, and Dunmore; and his public labors included a period of 60 years. His published works are: *Universalism Examined* (1826); *Scripture Doctrine of Chris-*

tian Perfection (1841); *Rule of Faith* (1844); *Reply to Bascom on Slavery* (1845); *Christian Exertion* (1845); *Manly Character* (1852); *History of Wyoming* (1858); *Early Methodism within the Bounds of the Old Genesee Conference* (1860); *Our Country* (1865). Consult his autobiography (New York, 1874).

PECK, GEORGE RECORD (1843-). An American lawyer, born in Steuben Co., N. Y. He studied law privately and was admitted to the bar in 1866. Meanwhile, during the Civil War, he had served first in the heavy artillery of the First Wisconsin Regiment and later in the Thirty-first Infantry. He practiced his profession at Independence, Kans., at Topeka (1874-93), and thereafter in Chicago as member of the firm of Peck, Miller, and Starr. While in Topeka he was United States district attorney from 1874 to 1879. As a lawyer he made a wide reputation as solicitor of the Atchison, Topeka, and Santa Fe Railroad and later as general counsel of the Chicago, Milwaukee, and St. Paul. He declined appointment to the United States Senate in 1892, but in general was influential in Republican party affairs. In 1904 he was government delegate to the Universal Congress of Lawyers and Jurists and in 1905-06 was president of the American Bar Association. Peck became known as an orator and as a contributor to jurisprudence.

PECK, HARRY THURSTON (1856-1914). An American classical scholar, author, editor, and critic, born at Stamford, Conn., Nov. 24, 1856. He was educated in private schools and at Columbia College, graduating in 1881 after a brilliant undergraduate career, during which his literary gifts had already attracted wide notice. He was connected with Columbia from 1881 to 1910, as tutor in Latin and for a time in Semitic languages, professor of the Latin language and literature, succeeding Prof. Charles Short, and Anthon professor. In the field of classical studies, where he exhibited rare familiarity with the literature and the faculty of stimulating interpretation, his publications include: *The Semitic Theory of Creation* (1886); *Latin Pronunciation* (1889); *Suetonius* (1889); *Roman Life in Latin Prose and Verse* (1895); *Trimalchio's Dinner* (1899); *A History of Classical Philology* (1911). He was editor in chief of *Harper's Classical Dictionary* and editor of the *Students' Series of Latin Classics* and *Columbia University Studies in Classical Philology*. He was the first editor in chief of the *Bookman* and was continuously a member of its staff from 1895 to 1906; editor in chief of the *International Cyclopaedia* from 1890 to 1901 and coeditor of the first edition of its successor, the *NEW INTERNATIONAL* (1902-04); editor of *Appleton's Atlas of Modern Geography* (1892); coeditor of the *Library of the World's Best Literature* and of *Masterpieces of Literature*; literary editor and editorial writer of the *New York Commercial Advertiser* (1897-1901); and editorially connected with *Munsey's* and with a number of works of reference. Dr. Peck was a frequent and forceful contributor to magazines and newspapers. In addition to his professional writings his works include two successful child's stories, *The Adventures of Mabel* (1889) and *Hilda and the Wishes*; two volumes of essays, *The Personal Equation* (1899) and *What is Good English* (1899); *Greystone and Porphyry* (1899), collected poems; *The Life of Prescott* (1905); *Twenty*

Years of the Republic (1906), a collection of political personalia; *Literature and Studies in Several Literatures* (1909); *The New Baedeker* (1910). His last years were obscured by disease which led to his death at Stamford, March 23, 1914.

PECK, JESSE TRUESDELL (1811-83). An American Methodist Episcopal bishop, brother of George Peck. He was born at Middlefield, Otsego Co., N. Y., studied at Cazenovia Seminary, joined the Oneida conference in 1832, was principal of Gouverneur Wesleyan Seminary in 1837-41 and of the Troy Conference Academy at West Poughkeepsie, N. Y., in 1841-48, president of Dickinson College in 1848-52, pastor of the Foundry Church in Washington, D. C., two years. In 1854 he was appointed secretary and editor of the Methodist Tract Society. He labored eight years (1858-66) in California as pastor and presiding elder. Returning to the East, he was pastor in Peekskill, Albany, and Syracuse, and in 1872 was elected Bishop. He was one of the founders of Syracuse University. He published: *The Central Idea of Christianity* (1855); *The True Woman* (1857); *The History of the Great Republic Considered from a Christian Standpoint* (1868).

PECK, JOHN JAMES (1821-78). An American soldier, born at Manlius, N. Y. He graduated at West Point in 1843 and was assigned to the Second Artillery, with which he served both in the Southern and the Northern campaigns during the war with Mexico, winning by his gallantry the brevets of captain and major. In 1853 he resigned from the service and became treasurer of a projected railroad from New York to Syracuse and cashier of the Burnet Bank in Syracuse. He was a delegate to the Democratic National Convention of 1856. At the outbreak of the Civil War he accepted a commission as brigadier general of volunteers in the Federal service. In 1862 he took part in the Peninsular campaign, and after the battle of Malvern Hill (July 1, 1862) commanded the infantry of the rear guard. On July 4 he was promoted to be major general, and after the withdrawal of the main army from the Peninsula commanded the troops left to hold the strategic position at Suffolk (September, 1862-May, 1863). There he was attacked by Generals Longstreet and D. H. Hill with a superior force, but managed to hold his own until General Hooker's movements before Fredericksburg caused the Confederate government to send its forces north. He was mustered out of the service on Aug. 24, 1865, and in 1867 he organized the New York State Life Insurance Company at Syracuse, of which he was president until his death.

PECK, SAMUEL MINTURN (1854-). An American poet, born in Tuscaloosa, Ala. He was educated at the University of Alabama and in New York. His poems are collected under the titles: *Cap and Bells* (1886); *Rings and Love-Knots* (1893); *Rhymes and Roses* (1895); *Fair Women of To-day* (1896). His *Alabama Sketches* (1902) and *Maybloom and Myrtle* (1910), together with short stories contributed to the magazines, constitute his fiction.

PECK, TRACY (1838-). An American Latin scholar, born at Bristol, Conn. He graduated from Yale in 1861 and continued his studies at the universities of Berlin and Bonn, Germany. From 1871 to 1880 he was professor of Latin at Cornell University; thereafter un-

til his retirement in 1908 he occupied a similar chair in Yale University. In 1898-99 he served as director of the American School of Classical Studies at Rome, where he made his permanent residence after 1909. Of the American Philological Association he was president in 1885-86. His publications include papers read before the American Philological Association and, with Professor Greenough, an edition of *Livy*, books xxi and xxii (1893). With Prof. C. L. Smith he was editor in chief of the *College Series of Latin Authors* (15 vols. up to 1915).

PECK, WILLIAM GUY (1820-92). An American soldier and mathematician, born at Litchfield, Conn. He graduated at West Point in 1844 and was assigned to the corps of topographical engineers. In 1845 he accompanied Frémont's third exploring expedition through the Rocky Mountains, and during the war with Mexico served under General Kearny in the Army of the West. In 1847 he was appointed assistant professor of mathematics at the Military Academy, but in 1855 he resigned from the army and became professor of physics and engineering at the University of Michigan. In 1857 he accepted the position of adjunct professor of mathematics and astronomy at Columbia and in 1861 he was promoted to the chair of mathematics, mechanics, and astronomy. He published a number of excellent elementary textbooks on mathematics, and was joint editor with Prof. Charles Davies of the *Mathematical Dictionary and Cyclopædia of Mathematical Sciences* (1855).

PECKHAM, pēk'hām or -am, RUFUS WILLIAM (1838-1909). An American jurist, brother of Wheeler Hazard Peckham. He was born in Albany, N. Y., and was educated at the Albany Academy and in Philadelphia. Admitted to the bar in 1859, a year later he succeeded his father as law partner of Lyman Tremain. On Tremain's death in 1878 the firm became Peckham and Rosendale. For three years Peckham served as district attorney of Albany County. He was counsel to the Albany and Susquehanna Railroad in its famous suit against the Erie, and in 1881 was successful in the national bank tax cases before the United States Supreme Court. He had already entered politics, serving as delegate to the Democratic national conventions of 1876 and 1880, in which he supported Tilden and Hancock. After a short period as corporation counsel of the city of Albany Peckham entered on his judicial career as associate justice of the State Supreme Court (1883-86). For nine years he sat on the bench of the (New York) Court of Appeals, and in 1895, by appointment of President Cleveland, he became associate justice of the United States Supreme Court. Regarded as one of the ablest jurists in the country, Peckham was also known as one of the most conservative. His opinions in several notable cases concerned with the police power of the States and involving labor and corporation problems were of far-reaching importance; among these were *Ex parte Young*, *Lochner v. New York*, the Addyston Pipe case, and the Trans-Missouri Freight and Joint Traffic Associations cases. Peckham refused to recognize an interpretation of the Sherman Anti-Trust Act (q.v.) based upon the common law. Consult W. H. Taft, *The Anti-Trust Act and the Supreme Court* (New York, 1914).

PECKHAM, WHEELER HAZARD (1833-1905). An American lawyer, brother of Rufus William

Peckham, born in Albany and educated at Union College. He practiced in New York City with his father then in St. Paul until 1862, and in 1864 again in New York, becoming a member of the firm of Miller, Peckham, and Dixon. His growing fame as a constitutional lawyer and his argument on the constitutionality of taxing greenbacks won him the friendship of his opponent in this case, Charles O'Connor, who as Deputy Attorney-General during the exposure of the Tweed ring made Peckham his assistant. In 1884 he was appointed district attorney of New York City, but soon returned to private practice. In January, 1894, President Cleveland nominated him for the Supreme Court, at a time when he was president of the State Bar Association, but the nomination was not confirmed by the Senate, because of the opposition of the New York Senators to Mr. Peckham's antimachine Democracy.

PECK/SNIEFF. A character in Dickens's *Martin Chuzzlewit*, a pompous hypocrite and fraud.

PECK/VILLE. A town in Blakely Borough, Lackawanna Co., Pa., 7 miles northeast of Scranton, on the Delaware and Hudson, the Delaware, Lackawanna, and Western, and the New York, Ontario, and Western railroads. It is in the anthracite region and has extensive coal mines. Its manufactures include iron and steel ware, lumber, powder, and silk. The electric-light plant is owned by the municipality. Pop., 1915 (local est.), 4000; of Blakely, 1910, 5345.

PE/COCK, REGINALD (c.1395-c.1460). A British Roman Catholic bishop, born in Wales. He was educated at Oxford and was ordained a priest in 1421. Ten years afterward he was master of Whittington College, London, and he was appointed rector of St. Michael's, in Riola, Bishop of St. Asaph's (1444) and of Chichester in 1450. He took an aggressive part in the controversy with the Lollards and published an introduction to the Christian faith in dialogue form, entitled *Donet* (c.1440), and *Repressor of Over Much Blaming of the Clergy* (c.1455). In his *Book of Faith* (c.1456; partially printed in 1688) he argued against the infallibility of the Church, and in later works went so far as to deny the authenticity of the Apostles' Creed and to place reason above authority. For these and other heresies and also on account of political opposition to his attitude and teaching, he was called to account before Henry VI and his lords at Westminster (1457) and was given the choice between the stake and recantation. He chose the latter, his 14 books were burned, and he ended his days in seclusion at Thorney Abbey, Cambridgeshire.

PECOS, pā'kōs. A ruined pueblo Indian village near the headwaters of the Pecos River in New Mexico (Map: New Mexico, D 3). It was abandoned in 1838 and its inhabitants are now extinct. Consult Bandelier, *Papers of the Archaeological Institute of America*, American Series, 1, 3, 4, and 5.

PECOS RIVER. The principal tributary of the Rio Grande. It rises at the foot of Baldy Peak, near Santa Fe, in north-central New Mexico, and flows first southeast, then southward along the western escarpment of the Llano Estacado, turning again southeast in Texas and emptying into the Rio Grande 36 miles northwest of Del Rio, Tex., after a course of 800 miles (Map: Texas, A 4). Its drainage area

includes more than 32,000 square miles. In its upper course it flows through a cañon-like valley, and it receives nearly all its tributaries from the west. Near Carlsbad and Hondo, N. Mex., the Reclamation Service has established reservoirs which provide for the irrigation of 20,000 and 10,000 acres respectively, and other extensive projects are planned.

PECQUET, pē'ká', JEAN (1622-74). A French anatomist, born at Dieppe. He studied medicine at Montpellier, where he made the important discovery of the course of the lacteal vessels, including the receptaculum chyli, or reservoir of Pecquet, as it is sometimes called, and the termination of the principal lacteal vessel, the thoracic duct, into the left subclavian vein. He wrote: *Experimenta Nova Anatomica* (Paris, 1651; Eng. trans. as *New Anatomical Experiments*, 1653); *De Circulatione Sanguinis et Chyli Motu*; *De Thoracis Lacteis* (1654).

PÉCS, päch. See FÜNFKIRCHEN.

PECTASE (from Gk. πηκτικός, *pēktikos*, coagulating, from πηγνύναι, *pēgnynai*, to solidify). Pectase, pectinase, and pectosinase are three enzymes that lead to the formation or transformation of pectic substances in plants. Pectosinase hydrolyzes the insoluble materials (pectose or calcium pectate) of the middle lamella of cell walls to soluble pectins. Pectase in the presence of salts of alkali earths, especially calcium salts, coagulates the pectins with the formation of gel. This enzyme is one of the coagulases, of which others are rennin, cyto-coagulase, and amylocoagulase. (See ASSIMILATION.) Pectase is rather generally distributed in organs of higher plants. In fruits the softening with the process of ripening is thought to be largely due to the transformation of pectase of the middle lamella to pectins. The coagulation of pectins in fruit juices leads to the production of jellies. Pectinase extracted from malt hydrolyzes pectins to reducing sugars, d-galactose, and l-arabinose. See DIGESTION IN PLANTS; ENZYME; PECTINS.

PECTEN. See SCALLOP.

PECTINASE. An enzyme which hydrolyzes pectose to reducing sugars—arabinose, etc. Pectinase acts upon either coagulated or unaltered pectic bodies.

PECTINS. Substances of general distribution in ripe fruits and rather common in organs of flowering plants. They probably originate from the pectose of the middle lamella of cell walls and are formed in great abundance in fruits during ripening. When treated with pectase the pectins coagulate, forming a gel. In boiled concentrated fruit juices they also coagulate, probably independently of enzymes, and, along with sugars, organic acids, and other substances, constitute jellies. It has been questioned whether pectins are carbohydrates, but fuller investigation indicates that they are. Hydrolysis with acids or pectinase (q.v.) transforms them to d-galactose and l-arabinose. See DIGESTION IN PLANTS; ENZYME; PECTASE.

PECTOLITE. A silicate of sodium and calcium occurring in silky white aggregates of acicular crystals. It is found with the zeolites in basic eruptive rocks.

PECTORAL CROSS. See COSTUME, ECCLESIASTICAL.

PECTORAL SANDPIPER (Lat. *pectoralis*, relating to the breast, from *pectus*, breast). A well-known migratory sandpiper (*Tringa*, or *Pisobia*, *maculata*) of North America, called

grass snipe, jacksnipe, and meadow snipe by gunners. It owes its book name to an extraordinary ability on the part of the male to puff out its throat (oesophagus) after the manner of a pouter pigeon. (The act is depicted on the Colored Plate of SHORE BIRDS.) It was first noticed by Edward Adams (*Proceedings Zoological Society of London*, 1859), and afterward confirmed, described, and figured by Nelson, Murdoch, and others in their works on the natural history of Alaska (cited under ALASKA), where it has its summer home. This performance is a part of its courtship, not only as an attention to the female, but as a menace to rivals. (Cf. RUFF.) During its migratory visits to the United States it is a favorite with sportsmen, because of its gamelike manner of lying well in the grass before a dog and its crooked, snipelike flight. Moreover, its flesh is exceedingly palatable.

PECTORILOQUY (from Lat. *pectus*, breast + *loqui*, to speak). The term applied to a distinct transmission of articulate voice sounds when the ear or stethoscope of the listener is placed upon the chest wall. This phenomenon was discovered and named by Laënnec (q.v.) in 1818. In the normal chest the voice sound is transmitted through the lung substance of the patient to the ear of the listener only as a distant, muffled sound, known as *vocal resonance*. Over the bronchi this vocal resonance is increased, the voice sounds become nearer and louder. When there is an approach to articulate speech, this is called *bronchophony* and occurs also over portions of lung tissue which have become solidified by disease. In pectoriloquy, however, the voice is not only louder and plainer, but words and even syllables are perceived with startling distinctness. The pathological conditions under which this occurs are either a consolidation of the lung substance connecting a large bronchus with the chest wall, which consolidation acts as an unusually perfect conductor of the vocal vibrations; the presence of a cavity in the lung having free communication with a bronchus, in which case the sound is conveyed by air; a pneumothorax having open connection with a bronchus; or, more rarely, compression of the lung by an extensive pleuritic effusion. (See PLEURISY.) As a rule, pectoriloquy is interpreted to mean the existence of a cavity in the lung with a thin layer of solidified tissue between it and the chest wall.

Whispering pectoriloquy is produced, under the same conditions mentioned above, when the patient whispers instead of talking. See AUSCULTATION; RESPIRATORY SOUNDS.

PECTOSINASE. See PECTASE.

PEDAGOGY, pēd'ā-gō'jī, or **PEDAGOGICS**, pēd'ā-gōj'iks (from Gk. παιδαγωγία, *paidagōgia*, training of children, from παιδαγωγός, *paidagōgos*, trainer of children, from *pais*, *pais*, child + *agōgos*, *agōgos*, leader, from *agein*, *agein*, to lead). The science of education; a body of facts and principles bearing on the aims and methods of effectively equipping the young for life—aiding them in attaining their spiritual majority and fitting them for their vocation. Numerous and complex, the problems of education can be worked out only by the help of the sciences of psychology, physiology, ethics, sociology, and anthropology, and, in the light of the spirit of the time, the ideals of the nation, and existing local conditions. Any solu-

tion of them, indeed, is impossible, except through the coöperation of the various institutions that make up society: the home, the school, the church, the diverse vocations, and the state in its several functions. The distinguishing characteristic of the study of pedagogy from 1905 to 1915 was the steady application to it of experimental methods which tended to place the subject on a definitely scientific basis. This aspect in the development of pedagogy is treated below under the caption of *Experimental Pedagogy*.

While there are certain fixed factors in education, and certain principles of universal application, the greater part of the educational field is characterized by adjustment and change.

The expansion of modern knowledge and the complexity of modern life are reflected in the modern crowded curriculum and in the problems to which it gives rise. In a "three-R" elementary curriculum, or in a college course consisting largely of Greek, Latin, and mathematics, the choice of studies was only an academic question; with a multitude of subjects to choose from, the question of educational values becomes vital. This question has been asked and answered in various ways. With Herbert Spencer it took the form: What knowledge is of most worth? Spencer's answer was, Science, by which he meant the scientific habit of mind in mastering those subjects which bear on man's efficiency in society, including primarily the natural sciences and history, with literature and art subsidiary to these. Nicholas Murray Butler, in an essay bearing the same title, assigns the highest place to those subjects that afford in the highest degree nurture and exercise to man's spiritual nature, and in this judgment modern educators generally agree with him. Attacking this same problem at closer quarters, Commissioner William T. Harris has asked the question, What groups of subjects are essential to a complete education? and gives this answer: There are six coördinate groups of studies: (1) mathematics and physics, which give us the command of nature quantitatively; (2) biological science, which gives us the key to the organic phase of nature; (3) literature and art, which reveal human nature in its intrinsic form and show man in his relation to social institutions; (4) grammar and language, and studies allied with them, such as logic and psychology, which enable the mind to know itself analytically; (5) history, or the study of the development of the state and its relations to the individual; (6) religion, which looks at human experience and knowledge in their relation to God. An education which should not provide at least the elements of each group would be incomplete.

The question still remains, Upon what principles shall studies be chosen within these groups? A favorite way of approaching this question has been to classify all subjects (1) as giving discipline to the faculties of the mind, (2) as giving practical training for life, (3) as giving culture. Thus, bookkeeping and spelling are valued chiefly for their practical value; algebra and grammar for their disciplinary value; literature and art for their power to give that sympathy, appreciation, and insight into the meaning of life which we call culture. But it is clear that no subject is without some value in each of these departments. And, further, it appears that much depends on the

method of teaching, the purpose in view, and individual attributes; the same study may serve now as a bread-and-butter subject, now as a culture subject, according to circumstances. The same study may train memory or reason, according to the method employed; or the same study may be good for one pupil and not so good for another. Moreover, with the fall of the faculty theory in psychology, the dogma of formal discipline has been discredited. It is held that there is no such thing as training "the memory," and that to transfer skill acquired in one department to another department is not in any strict sense possible. It follows that in any given case considerations of environment, aptitude, aim in life, and method must have greater weight in determining the choice of studies than values assigned to studies in the abstract. These considerations furnish justification from one point of view for the expansion of the modern curriculum and the concomitant development of the elective system.

At what point shall studies be introduced? This question is to be answered partly in the light of the capacity of the child and partly in the light of the culture-epoch theory, which assumes that the child in his development passes through a series of stages corresponding closely to the epochs through which the race has passed in its progress from primitive to modern culture. Gen. Francis A. Walker, after investigating the study of arithmetic in the elementary school, protested against "prying up" the powers of the child by giving him tasks for which he was not yet ready and which he could in due time perform naturally and easily. On similar grounds it has been proposed to decrease the amount of reading and writing called for in the first three years of school; but advocates of this plan seem not to give sufficient weight to the fact that children in these very years show a decided tendency to perform these activities and a marked ability to master them. It is clear that to postpone the study of mythology and of mediæval history until the child has passed the culture epoch to which they appeal involves waste. The application of this latter principle, however, is made difficult by the fact that the youngest child is a member of the modern world as well as of the primitive world—that he can and must learn about the arrangements for heating and lighting his own house as well as about the old-fashioned backlogs and tallow candles.

Children in the elementary school sometimes carry as many as 15 so-called "subjects" at one time: how shall they be kept from being overwhelmed by the multiplicity of subjects and interests? Certain well-established principles throw light on the solution of this problem. First, the doctrine of apperception, which asserts that the mind acquires knowledge by means of knowledge already possessed—that what we can learn is conditioned absolutely by what we have to learn with. Secondly, the principle of self-activity, which affirms that the child is not primarily a knowing being, but an active being, whose instincts and impulses start him on the way to knowledge, and whose practical needs teach him to think. Empirical observation attests the truth of these principles; it has been conclusively shown, e.g., that under the old régime children learned the little they had to learn with greater difficulty and strain than they accomplish their greatly increased

tasks, if only the work be properly organized and conducted.

In order to understand the various attempts at *correlation* it is necessary to consider the evolution of the idea. The revolt against the isolation of studies was the outgrowth of Herbartian doctrines. According to Herbart, "erziehender Unterricht"—instruction that educates, or education through instruction—expresses the aim and the chief means of formal school work. Now, education means moral character building, and character is produced by the training and culture of volition—the will being reached only through the emotions, these in turn depending on ideas. But not from ideas in any form and relation do emotional warmth ("interest") and volitional energy spring, but only from those ideas that are knit into a living whole. Hence the fundamental significance in the Herbartian pedagogy of the phrase "circle of thought," by which it is meant that instruction should be both many-sided and closely connected; and hence the capital rôle played in the same system by *interest*—interest being that condition of mind of which the cause is knowledge made real and vital through being related and of which the effect is volition. The early schemes of correlation were produced in Germany and were characteristically formal, treating correlation as chiefly a question of curriculum, and so perhaps better described as schemes for the *coördination* of studies. Usually, however, German plans of coördination took the form of *concentration*, whereby certain studies were made dominant and others were treated as subsidiary to them. There was no agreement as to what studies should be the core—some choosing literature and history, others natural sciences. In America, under the impulse of Herbartian ideas, much fruitful experimenting has been done, at first after the German manner (taking *Robinson Crusoe*, e.g., as the central subject of a year's work and "relating" arithmetic, geography, reading, drawing, manual training, and other studies to this core) and later in ways independently American. For the most part this latter work may be described as *informal correlation*. For example, a part of the work of a year or a part of the year in a certain grade may cluster around the reading of *Hiawatha* and the making and decorating of various objects illustrative of the story, no attempt, however, being made to confine the work in arithmetic, geography, and nature study within the limits of *Hiawatha's* life. Even where correlation is not recognized in the curriculum there is an increased tendency to recognize the manifold interrelations which exist between all subjects and parts of subjects. In support of such partial schemes it is claimed (1) that variety and difference are as essential to wholesale mental development as are identity and relatedness; (2) that the child studies with intense interest and with assimilation so apparently isolated a study as arithmetic; (3) that a correlating teacher can make an apprehensive child even without a correlated curriculum. But there can be no doubt that waste is often avoided by studying at the same time subjects related both to each other and to the theoretical and practical interests of the child.

The most important single contribution to this subject made by American educators is the monograph *Interest as Related to Will*, by Prof. John Dewey, in which interest is represented as

arising when the child does that which makes for self-expression (self-realization). This view not only places interest in its proper subordinate place, but also makes it clear that a curriculum is not to be worked out in the closet, and that character building does not necessarily result when the child is occupied with apparently interrelated studies. In the practical working out of this principle the child, with his manifold impulses to act, his interests, his social relationships, his spiritual environment and heritage, becomes the core of correlation, and those creative social activities that have to do with providing food, clothing, shelter, and æsthetic expression become the gateway both to knowledge and to character. The influence of this insight into the dynamic nature of education (whereby "educative activity" is substituted for "educative instruction") has been and is destined to be profound and far-reaching.

Ever since the rise of democratic institutions there has been developing a new conception of the worth of the individual, and during the past 50 years this conception of the individual has been modified and reinforced by a new conception of society. It is now coming to be vividly realized that the ideal of individual development is realized in the highest social efficiency, and that the ideal social or institutional development demands individuals that have attained perfect self-realization. This insight has been reflected in educational aims and methods. In the old education, based on a certain lack of faith in the individual and on contempt for the body and this present world, the characteristic notes were authority, intolerance, and disregard of hygienic laws; the mainstay in teaching was naturally memorizing. The new education is based on respect and even reverence for humanity—on belief in the worth of the present moment and on the doctrine of evolution. Its dominant features are, therefore, appeal to individual observation, experience, judgment, reason—enrichment of school programmes; and enlightened consciousness of the differences in individuals and a consequent tolerance and adaptation. Under the impulse of these conceptions school hygiene is recognized as an important adjunct to pedagogics; psychology, instead of dealing only with traits supposed to be common to all, is investigating those peculiar to types and even to individuals; child study makes careful studies of actual children at various stages of development in order to determine effective ways of dealing with each type at each stage. As for educating the child to be a social being, the new education proceeds by regarding and treating him as a social being from the start. The most advanced schools of all grades are those which recognize most fully the possibilities of social training latent in the class, the school, the playground. Constructive work, especially the form known as group work (where all the members of the class are engaged on a common project, each contributing his share), is a fine illustration of how a subject can contribute to both individual and social development. Mention has already been made of the recognition of the need of adjusting the child to his social environment through the curriculum. The bearing of these ideas on *moral education* is obvious. Morality is to be attained in the individual as such only through his own free and responsible choosing to obey law; it is best to be attained in the individual considered

as a social unit by living morally in the society of which he is a member—the family, the school, the neighborhood.

The main objection urged against the new education is that it fails to provide for training that power to "endure hardness as a good soldier" which is the bone and sinew of character; that in suiting school work to the grain of a child's disposition it fails to prepare for those demands of life which go against the grain. It is a sufficient answer to this objection to say: (1) that bone and sinew are none the less firm, and they are the more useful, when developed by growth rather than inserted ready-made; and (2) there is no virtue or strength either in school or in life to be gained by overcoming difficulties merely by a dead pull, the secret of power in performing difficult tasks is the ability to raise any task above the level of drudgery into relation with life as a whole. By giving this power the new education greatly multiplies the ability to overcome obstacles.

Educational Methods. The word "method" is used in two senses: (1) to designate those special rules which are applicable to the teaching of a particular subject, and (2) to designate general modes of procedure applicable to all subjects. Examples of the first are the various methods of teaching reading, as the phonetic method, the sentence method, the word method, etc. Each of these methods can be defended on psychological grounds, yet each is incomplete. The most effective method is that which combines the good points of all methods into one. The final test of a method is not, "Can arguments be made in its favor?" but "Will it work?"

Under the head of "general method" belongs the doctrine of the *formal steps of instruction*. This doctrine is based on the assumption that the mind must follow a certain order of processes in grasping any subject presented to it: there must be *preparation* of the ideas already in the mind, *presentation* of the new facts, *comparison*, *abstraction*, *generalization*, whereby the meaning of the facts is arrived at and stated in terms; and, finally, *application*, whereby the knowledge thus gained is translated into life. The essential value of this doctrine lies not so much in its assumption of an unchanging time order of processes as in its emphasis of the fact that there are certain processes which are essential to a complete act of instruction.

Using "general method" in the sense of a law of teaching applicable to any subject, the following maxims may serve as examples: 1 In all teaching, whether in instruction or in training, let spirit be uppermost and mechanism subordinate to it. This is the first and great commandment, upon it are based a multitude of specific directions; such as, thought first, form second; interest first, then criticism; praise first, if possible, and let blame be simply the subtracting from a fund of praise; let the teacher's first aim be to lead the pupil to love a subject, and afterward he may do what he will; seize the moment of excited curiosity that it may not run to waste—an impulse of the human spirit is a power which the teacher cannot produce at will, but which unfortunately he can cramp and suppress; on the other hand, the teacher should make mechanism his ally, not his enemy. "Drive thy habits, let them not drive thee." 2. A second general principle may be stated thus: we learn most effectively by our

own activity under the spur of a practical interest. We learn least effectively when we are least active and least interested. A teacher who applies this principle will multiply opportunities whereby his pupils may learn by experience, by discovery, by executing; by object lessons, laboratory and shop work and the relations of school life, whereby they may apply what they have heard or read or gained in any secondhand way, thus supplying, though in the reverse order, the element reality. 3. A third general principle of teaching may be described as learning by thinking. The teacher who follows this leads his pupils to avoid being swamped by details, because, grasping together many particulars into a convenient bundle duly tagged, he will form in them the habit of foresight and forethought, and he will develop in them the power to search out meanings and to find the essential point of a problem, a situation, or an argument.

In deciding the order to be followed in teaching the topics in a subject, two conflicting systems have held sway. The first arranges the topics of the subjects in logical order, ignoring the fact that what is first in experience is last in thought, that the psychological order is usually the reverse of logical order. The second arranges the topics with reference to the child's supposed needs, either (1) teaching related processes concurrently (as in the Grube method in arithmetic) and carrying a number of topics abreast, returning to each at more or less regular intervals with increased power, as in the *spiral method*, or (2) determining the order of topics rather by the need of the child than by the strict development of the subject; e.g., introducing the subject of osmosis at the point when the children are eager to understand how the root of a plant receives nourishment from the earth.

By the *inductive method* of teaching a pupil is led from facts to generalizations; e.g., in natural science where individual forms are first observed, then classified according to essential characteristics, and in the study of syntax, where the rule is formulated after several cases of the construction are observed and compared.

By the *deductive method* the teacher or the author first states a principle and then proceeds to elucidate and exemplify it, as when in grammar the definition of noun is given and then examples of nouns. Each of these methods has its own field, every subject having its deductive and its inductive stage, and every study of any subject being partly deductive and partly inductive. In the *Socratic method* the teacher asks questions designed to lead the pupil to think about what he already knows, to see his mistakes, revise his judgments, and discover the truth. This method is especially applicable in subjects involving moral or æsthetic judgments, where the pupil has experiences and knowledge more or less unorganized. Akin to this is the *method of discovery*, which leads the pupil to experiment, observe, infer, and formulate conclusions. In all the above methods the principle of self-activity and participation is called in. Often combined with these is the *method of discussion*, in which the teacher proposes, or has members of the class propose, theses to be defended. The advantages and dangers of this method are extreme. Great skill and address, together with the power of summarizing the discussion, are required in the leader. All these

methods aim to make the pupils ready, resourceful, self-reliant. They need to be supplemented by some form of the *lecture method* or by the *textbook method*, which are strong on the side of exactness and breadth. The *recitation* (which is the name applied in the United States to class exercises in general) varies in efficiency according to the method pursued. The minimum of advantage results if the time be spent in saying lessons learned memoriter from a book or in reciting facts more or less known to all the class. A class exercise is at its best when the class is engaged upon some problem towards the solution of which each one, including the teacher, from his peculiar point of view, contributes his proper share. It has been proposed that instead of recitations in which the quick and the slow proceed at the same rate, each pupil should be allowed to go at his own pace under the guidance of the teacher. This plan (known as the *Pueblo plan*), though it contains an element of wisdom, is of only limited application. Its vital defect lies in its failure to recognize sufficiently the social value of the recitation.

Experimental Pedagogy. During the decade 1905-15, largely through the rapid development of experimental methods in psychology in all its branches, the study of pedagogy has become experimental. The way was paved during the last two decades of the last century by a closer study of the child; but while this method showed an advance, it depended too largely on the observation of individuals and in general dealt with the child before school age. Experimental pedagogy aims to bring to the study of education the exact methods and equipment of a science; it is based not merely on the observation of individuals, but on the application of statistical measurement of facts bearing on the school life of children under actual classroom conditions. Hence pedagogy, except in so far as the general theory of the aim of education is concerned, is becoming a quantitative and inductive science, where hitherto it was wholly qualitative and deductive; in place of generalizations of the theorists the teacher is now made familiar with the results of experiments dealing with different phases of school work reached by scientific methods similar to those of the laboratory. While the methods of experimental pedagogy are essentially those of the experimental psychologists, the point of view is different in that it deals with the school child not merely with reference to his mental makeup, but also with his physical, moral, and social sides.

Although the progress and results of the study have been remarkable in the short time of its existence, it must still be regarded as in its early stages. Before school work can be definitely affected much remains to be done in standardizing results and in making these available for the classroom teacher. One of the strongest features in the study of experimental pedagogy is that studies are made not only under widely varying conditions in each country, but that there is much international co-operation.

It is impossible within this brief compass to do more than indicate the nature of the subjects with which experimental pedagogy treats. Starting with the child as a human being, it seeks to trace the relationship between his native ability and school progress. Valuable con-

tributions have been made on this phase by the tests of Binet and Simon for measuring native ability. Allied to this topic is the study of the influence of individual differences and a recognition of their importance in school work. In a few other subjects, such as the questions of fatigue, memory, attention, transfer of training, etc., it is difficult to distinguish between experimental pedagogy and experimental psychology. More closely and definitely related to school work have been such school studies as handwriting, spelling, arithmetic, drawing, and English composition. The aim here has been not so much to investigate the processes of learning these subjects as to discover what standards may be expected from children in different stages of school life. To this end scales of measurement have been developed already in the subjects mentioned with the aid of these scales, some of which have been standardized for the whole country, e.g., in handwriting, a teacher in any school can not only measure the progress of her pupils, but can judge whether their standard of attainments reaches the general standard to be expected, according to the "measuring stick" from children of that age. Scales in handwriting have been developed by Professor Thorndike of Columbia University and Dr. Ayres of the Russell Sage Foundation, in arithmetic by Mr. Curtis, in drawing by Professor Thorndike, and in English Composition by Professor Hillegas of Columbia University and Dr. Ballou of Boston. The great value of these studies is that they set up easily recognizable standards; their danger is that it may sometimes be forgotten that in general they indicate the minimum attainment to be expected at any age. At the same time, since they are applicable to all stages of school work, they offer better bases for the classification of pupils than any that have existed hitherto. From these few instances, the first fruits of the study of experimental pedagogy, it will be recognized that it is now being placed on a scientific basis, and that scientific authority will take the place in future of tradition and fads.

Bibliography. W. T. Harris, *Psychologic Foundations of Education* (New York, 1898); W. C. Bagley, *The Educative Process* (ib., 1905); N. M. Butler, *Meaning of Education* (ib., 1905); John Dewey, *School and the Child* (London, 1906); id., *School and Society* (Chicago, 1906); E. P. Cubberley, *Changing Conceptions of Education* (Boston, 1909); C. W. Eliot, *Education for Efficiency* (ib., 1910); E. N. Henderson, *Principles of Education* (New York, 1910); W. C. Ruediger, *Principles of Education* (Boston, 1910). For experimental pedagogy: Neumann, *Experimentelle Pädagogik* (Leipzig, 1907); E. Claparède, *Experimental Pedagogy* (London, 1911); E. G. Rush, *Experimental Education* (ib., 1912); "Standards for Measuring Efficiency of Schools," in *United States Bureau of Education, Bulletin No. 13* (Washington, 1913); E. L. Thorndike, *Educational Psychology* (New York, 1914).

PED'AL (Lat. *pedalis*, relating to the foot, from *pes*, foot). Any part of a musical instrument acted on by the feet. The pianoforte, the harp, and the organ are furnished with pedals, which, however, serve an entirely different purpose in each instrument. See HARP; ORGAN; PIANO.

PEDAL POINT. See ORGAN POINT.

PED'DLER. A person who travels from

place to place selling at retail goods, wares, and merchandise, which he carries about with him. Peddlers are to be distinguished from ordinary traveling salesmen, who sell goods by sample and have a recognized headquarters from which the goods are shipped. Because of the irresponsible character of most peddlers and the difficulty of tracing fraud or other crime to them, statutes have been enacted in almost all of the United States requiring them to take out licenses and to conform to certain other regulations, such as wearing a badge or shield, bearing their license number, where it can be easily seen. See LICENSE.

PEDEE RIVER. The name of the Yadkin River after it enters South Carolina (Map: South Carolina, E 2). The Yadkin has its sources in the Blue Ridge, in Wilkes County, northwest North Carolina, and flows through the State in a south-southeast direction. In South Carolina it receives as tributaries Lynchies River, from the west, and the Little Pedee River and part of the Wacamaw River, from the north. It empties into the Winyaw Bay at Georgetown. It is navigable for 150 miles.

PEDERSEN, pā'dēr-sēn, CHRISTIERN (1480-1554). A Danish theologian and writer, known as the Father of Danish Literature. He was canon of the cathedral of Lund, spent the years 1510-15 in Paris, and afterward became secretary to Christian II, whom he followed into exile (1525). Pedersen joined the Reformation, translated the New Testament in Holland (1529) and the Psalms (1531), and published many Lutheran tracts. Returning to Malmö (1532), he established a printing press. His greatest work was a translation of the Bible (1543), called the Bible of 1550, or Christian II's Bible. It was founded upon Luther's version and is an important landmark in Danish literature.

PED'ESTAL (It *pedestallo*, base of a pillar, from *piede*, from Lat *pes*, foot + *stallo*, from OHG *stal*, Ger *Stall*, stall). A base for columns, statues, vases, etc. The pedestal is much used in classic (especially Roman) architecture. Like the column it has a base, a body or central block, called the dado or die, and a cap or cornice, sometimes called the surbase. Its function in columnar architecture is to permit the use of a smaller column and entablature than would otherwise be possible for a story of a given height. In connection with sculpture the pedestal is a feature of the utmost importance, on which designers in the Renaissance period bestowed careful study. The superb pedestal of the Colleoni statue at Venice is an example of this. The pedestal of the Statue of Liberty in New York harbor is a vast granite structure nearly 150 feet high, the cost of which, borne by popular contributions from all parts of the country, was over \$300,000.

PEDIANUS, QUINTUS ASCONIUS. See ASCONIUS PEDIANUS, QUINTUS.

PE'DIATRICS. See CHILDREN, DISEASES OF.

PEDIC'ULA'RIS (Lat., lousy). A genus of more than 100 species of the family Scrophulariaceæ, some of which have rather large and finely colored flowers. Several species have been called lousewort, the English equivalent of *Pedicularis*, from their supposed influence in producing the louse disease in sheep. Their acidity seems to make them injurious as sheep food. Many species are found in continental Europe and northern Asia and some in North America.

A few species are cultivated chiefly for their finely cut beautiful foliage. *Pedicularis canadensis*, wood betony, is the most common species in the United States. See Colored Plate of MOUNTAIN PLANTS.

PEDIC'ULA'TI (Neo-Lat. nom. pl., from Lat. *pediculus*, little foot, dim. of *pes*, foot). An order of marine fishes having the carpal bones elongated into a kind of arm which supports the broad pectoral fin, and the anterior dorsal fin reduced to a few tentacle-like, mostly isolated spines: the anglers (see ANGLER), frogfishes, etc. See Plate of ANGLERS AND BATFISH.

PEDIGREE (of uncertain etymology, perhaps from OF. *ped de grue*, crane's foot, in allusion to the resemblance of the lines of a pedigree to a bird's foot). Family relationship traced back through a number of degrees or generations, sometimes including the record of births, marriages, and deaths. The term is most frequently employed in the law in connection with a rule of evidence which forms one of the exceptions to the so-called hearsay rule of evidence, and may be generally stated to be that statements as to the pedigree of the party in question made by a blood relative of that party, as a brother, since deceased, may be repeated by a witness who heard them made. See AFFINITY, CONSANGUINITY, EVIDENCE, KIN, NEXT OF KIN.

PEDIMENT (Lat. *pedamentum*, prop for a vine, from *pedare*, to furnish with feet, from *pes*, foot). The low-pitched triangular gable at the end of the roof of a building of classic type. It is inclosed by the horizontal and the raking cornices, the latter following the slopes of the roof. In Greek temples the pediment was frequently enriched with sculpture, for which it forms a fine setting. The finest examples are the pedimental sculptures of the temples of Ægina, Olympia, and the Parthenon at Athens. The doors and windows of buildings of the Renaissance are often surmounted by pediments, either straight-sided or curved, and in the late or Barocco (qv) period these were often interrupted or cut away at the summit, to admit a bust, vase, or other ornament—the so-called broken pediment. Broken and scrolled pediments, often treated with great elegance, occur frequently in American Colonial architecture.

PEDOMETER (from Lat. *pes*, foot + Gk. μέτρον, *metron*, measure). An instrument resembling a watch and used for measuring distances traveled by walking. Such an instrument usually records on a dial plate the number of steps taken by the person carrying it or the distance based on the average length of step of the individual to which the mechanism can be adjusted.

PEDRARIAS DÁVILA, pā'drā-rē'as dā'vê-là (c.1440-1530). A Spanish administrator in America, born in Segovia, Spain. Pedro Arias Dávila was his proper name, but historians have contracted it. He distinguished himself in the conquest of Granada, and he served in the New World as Governor of the Spanish colonies on the Isthmus of Panama in 1514. He found a rival there in Balboa, whom he finally executed (1517). This deed put Pedrarias out of favor with the Spanish court, but the emissaries sent to dislodge him failed in their mission, and he continued Governor, founded Panama (1519), and -extended his sovereignty by settling colonies to the north and south. But he was jealous of any one else attempting the same, hindered Pizarro as much as he could, and had

Córdoba beheaded for trying to league himself with Hernando Cortés at Honduras. For these and other tyrannical acts Pedrarias was called upon to exchange the governorship of Panama for that of Nicaragua, where he died.

PEDREGAL Y CAÑEDO, pá'drá-gal' é ká-nyá'dó, MANUEL (1832-96). A Spanish jurist-consult and publicist, born at Grado (Oviedo). He studied law and took a prominent part in politics as an ardent Republican. After the abdication of Amadeus in 1873 and during the period of the Republic Pedregal was twice Minister of Justice and once Minister of Finance. The following year he returned to private life and devoted himself to study and to the foundation (1876) of the *Institución Libre de Enseñanza*, of which he was made rector in 1883. He reentered politics in 1882 as Deputy from Oviedo, and with Azcárate, Salmerón, Labra, and others, organized the Republican party called Centralista, which has stood for the best element in radical politics. His works include: *El poder y la libertad en el mundo antiguo* (1878), *Estudios sobre el engrandecimiento y la decadencia de España* (1878), *Nociones de hacienda pública* (1881), *Sociedades cooperativas* (1888), *Elección presidencial de los Estados-Unidos* (1892).

PEDRELL, pá-dré'l'y', FELIPE (1841-) A Spanish composer and writer on music. He was born at Tortosa and studied music entirely by himself. His works include the operas *El último Abencerraje* (1874), for which he wrote music and book, *Quasimodo* (1875), *El Tasso en Ferrara*, *Cleopatra*, *Mazeppa* (all in 1881), *La celestina* (1904), *La matnada* (1905). His most important work, and the greatest by a modern Spanish composer, is his trilogy *Los Puercos*, the first complete performance of which took place at Barcelona in 1902. Besides these he wrote also a mass, several larger choral works with orchestra, songs, and piano pieces. In all these works there are originality and a successful effort to build up a national musical style. Of even more importance is Pedrell's work as a critic and historian of music. The two great works, *Hispania Schola Musica Sacra* (1894 et seq.) and *Teatro lírico español anterior al siglo XIX* (1897 et seq.), are original and able. His lexicographical labors include *Diccionario técnico de la música* (1894) and a biographical dictionary of Spanish and Portuguese musicians (1897 et seq.).

PEDRO I, Port pron pá'dró (DOM ANTONIO PEDRO DE ALCANTARA BOURBON) (1798-1834) Emperor of Brazil. He was the second son of John VI, King of Portugal from 1816, and was born at Lisbon, Oct. 12, 1798. In 1807 the royal family fled to Brazil before the invading armies of France. There John VI, on the death of his mother, Maria I, was crowned King of Portugal, and Dom Pedro, heir apparent since the death of his elder brother (1801), attained much influence in politics in spite of his youth and his rather irregular education. In 1821 King John returned to Portugal and Dom Pedro was made Regent of Brazil. He soon threw in his lot with the Brazilian national party, which opposed the reactionary policy of the Portuguese Cortes. Finally, when Dom Pedro was ordered to return to Portugal, he declared the independence of Brazil and was crowned Emperor on Oct. 22, 1822. The slight resistance made by Portugal was easily overcome, and in 1825 the mother country acknowl-

edged the independence of Brazil. The popularity of the Emperor, which was at first very great, was gradually weakened by his ruthless suppression of opposition to his régime and his endeavor to establish despotic power. His promulgation of a new constitution in 1824 did little to strengthen his position, and he was forced to assemble the first Brazilian Congress in 1826. In 1828 the Province of Uruguay succeeded in establishing its independence of Brazil. Opposition to the government increased, and Pedro at length, April 7, 1831, abdicated in favor of his son, Pedro II, and went to Europe. He had been proclaimed King of Portugal upon the death of his father, in 1826, but had resigned the throne in favor of his daughter, Donna Maria da Gloria, who had been set aside by her uncle, Dom Pedro's younger brother, Miguel (q.v.). The ex-Emperor invaded Portugal in the early part of 1832 with an army largely made up of English and French volunteers, to make good his daughter's title to the throne. He occupied Oporto in July, and a year later made his entry into Lisbon after his admiral, Sir Charles Napier, had vanquished the fleet of Dom Miguel off Cape St. Vincent. The usurper was forced to abandon all claims to the throne in 1834. In August, 1834, Dom Pedro was chosen Regent of the Kingdom, but he died on September 24 of the same year, two days after the coronation of the young Queen, Donna Maria. Consult: J. Armitage, *History of Brazil . . . 1808 to . . . 1831* (2 vols., London, 1836); T. C. Dawson, *South American Republics* (New York, 1903); G. F. White, *A Century of Spain and Portugal: 1788-1898* (London, 1909).

PEDRO II (?1174-1213). King of Aragon, a brave soldier and a gifted troubadour. He succeeded his father, Alfonso II, in Aragon and Cataluña in 1196, and in France he secured the lordship of Montpellier. He was crowned at Rome in 1204 and promised to send a yearly tribute to the papal chair. His efforts to impose a new tax on his people aroused opposition on the part of the nobility and the towns and these formed a league against him. In 1212 he entered into an alliance with the kings of Castile and Navarra against the Almohades (q.v.), which resulted in the great victory of Las Navas de Tolosa on July 16. The next year he crossed into France to aid the Albigenses against Simon de Montfort (q.v.), and was killed at the battle of Muret, Sept. 2, 1213.

PEDRO II (DOM PEDRO DE ALCANTARA) (1825-91). An Emperor of Brazil, born in Rio de Janeiro. He was the son of Emperor Pedro I who when his son was but five years old was forced to abdicate in his favor (April 7, 1831). The years of his minority, when Brazil was governed by a regency, constituted the most stormy period of the country's history. He was declared of age in 1840, was crowned in 1841, and married in 1843 Theresa Christina, sister of Ferdinand II of the Two Sicilies. His sons died in childhood and his daughter Isabella (q.v.) became heiress to the crown. The early years of the reign of Pedro II were marked by revolutionary disturbances within the country and complications with the neighboring South American states. Revolts in the provinces of São Paulo and Minas Geraes were suppressed in 1842, as were similar insurrections in Rio Grande do Sul in 1845 and Pernambuco in 1849. In 1851 Brazil assisted Gen. José de Urquiza, Governor of Entre Ríos, in his struggle against

Rosas, the Dictator of Buenos Aires, and was instrumental in bringing about the fall of the Dictator. A five years' struggle in conjunction with Uruguay and the Argentine Republic against Francisco Solano López (q.v.), the Dictator of Paraguay (1865-70), ended in the triumph of the allies. In 1867 Dom Pedro opened the Amazon to the commerce of all nations. In 1871 a law was passed for the gradual abolition of slavery and the question of abolition continued to be agitated until 1888, when a law was passed providing for immediate emancipation. This act drove the rich planters into the Republican ranks, and as a result of a revolution instigated by the officers of the Brazilian army, Dom Pedro was forced to abdicate and a republic was proclaimed on Nov 15, 1889. A pension was conferred on the ex-Emperor and he was sent to Europe on a government vessel. Dom Pedro spent the remaining years of his life in France, and died in Paris, Dec. 5, 1891. Dom Pedro, who ordinarily ruled through responsible ministries calling to power the Conservatives and the Liberals, gave Brazil an enlightened and progressive administration. He was a man of wide culture, and Brazil made great progress under his guidance. He traveled extensively, both in America and in Europe, and devoted much time to studying systems of government and education. Consult B. Mossé, *Dom Pedro II, empereur du Brésil* (Paris, 1889), and T. C. Dawson, *The South American Republics* (New York, 1903).

PEDRO CAMPAÑA. See KEMPENEER, PETER DE.

PEDRO THE CRUEL (1334-69). King of Castile and León from 1350 to 1369. He was the son of Alfonso XI and Maria of Portugal, and was born at Burgos, Aug. 30, 1334. On his father's death Pedro succeeded to the throne without opposition. He was greatly influenced by his mother, and by Albuquerque, his favorite. His bastard brother, Henry of Trastamare (q.v.), plotted against him constantly. But the great opposition which he encountered was due to his marriage, in 1353, to Blanche of Bourbon, whom he abandoned after three days, and a second marriage in 1354 to Juana de Castro, whom he abandoned after two days. The friends of both joined his brothers. He was taken prisoner in 1354, but soon escaped and took cruel revenge. From 1357 to 1361 he was engaged in a war with Pedro IV of Aragon. Henry of Trastamare, who had fled to France, returned (1366) at the head of a body of exiles, reinforced by Bertrand du Guesclin (q.v.) with an army of mercenaries and aided by Aragon, France, and the Pope. Pedro prevailed upon Edward, the Black Prince, to espouse his cause. Edward invaded Castile in the spring of 1367, defeated Henry and Du Guesclin at Najera, and restored Pedro to the throne. But the King disgusted his chivalrous ally by his cruelty to the vanquished and paid no heed to his remonstrances; Edward accordingly repassed the Pyrenees and left the treacherous monarch to his fate. The whole Kingdom groaned under his cruelties; rebellions broke out everywhere, and in August, 1369, Henry returned. Pedro's forces were routed at Montiel and he himself was compelled to retire for safety within the town, whence he was treacherously decoyed and captured by Du Guesclin. He was carried to a tent, where a quarrel took place between him and Henry, in which the latter killed Pedro. Consult J. Catalina García,

Castilla y León durante los reinados de Pedro I, Enrique II, Juan II, Enrique III, vol 1 (Madrid, 1891), and Burke, *A History of Spain*, vol 1 (London, 1895). An entertaining account is to be found in Prosper Mérimée, *Histoire de D. Pedro I, roi de Castille* (Paris, 1843).

PEEBLESSHIRE, pē'b'l-shēr, or TWEEDDALE. A county of southeast Scotland (Map: Scotland, E 4). Area, 348 square miles. The surface generally is mountainous, 450 feet above the level of the sea at the lowest point, attaining a maximum of 2754 feet in Broadlaw. The principal river is the Tweed (whence Tweeddale) and its affluents. The arable lands in the valleys produce cereals and green crops, the highlands being chiefly pastoral. Coal is mined and there are deposits of ironstone and limestone. The many streams are well stocked with fish. Woolens are manufactured. Capital, Peebles. Pop., 1901, 15,066; 1911, 15,258. Consult Chambers, *A History of Peeblesshire* (Edinburgh, 1864).

PEEKSKILL. A village in Westchester Co., N. Y., 41 miles north of New York City, on the east bank of the Hudson River, just below the Highlands, and on the New York Central and Hudson River Railroad (Map: New York, B 2). It has several private secondary schools, the Field Library, Helping Hand Hospital, St. Joseph's Home, a House of the Good Shepherd, St. Mary's School (Protestant Episcopal), Peekskill Military Academy, and the State Military Camp. There are manufactures of stoves, oil-cloth, fire brick, foundry facings, charcoal products, hats, underwear, yeast, whisky, etc. The water works are owned and operated by the municipality. Peekskill, settled in 1764, derives its name from Jans Peek, an early Dutch navigator. It was incorporated as a village in 1816. Near it is the famous Robinson house, the headquarters of Generals Putnam and Parsons in 1778-79 and of Arnold in the summer of 1780. It was here that Arnold first learned of the capture of André. Pop., 1900, 10,358; 1910, 15,245; 1915 (State census), 15,491.

PEEL. A seaport town and a favorite watering resort on the west coast of the Isle of Man (Map: England, B 2). It was formerly called Holm. Its fisheries are productive and the building of vessels of small tonnage and the manufacture of nets, sails, and ropes are carried on extensively. At the north extremity of the bay on which it stands are several grotesque and romantic caverns. The south extremity is formed by St. Patrick's Island, which contains the ruins of Peel Castle, described in Scott's *Peveril of the Peak*. The castle was formerly the frequent residence of the earls of Derby, then lords of the Isle of Man, and is expressly named in the original grant of Henry IV to the Stanley family. It incloses a round tower and the ruins of the cathedral of St. German, beneath which is a strong subterranean dungeon, where many notable persons were imprisoned. Pop., 1901, 3304; 1911, 3920.

PEEL, ARTHUR WELLESLEY, VISCOUNT (1829-1912). An English public official, son of Sir Robert Peel. He studied at Eton and at Balliol College, Oxford, where he graduated in 1852. From 1865 to 1895 he was a Liberal member of the House of Commons, of which he was also Speaker in 1884-95. When Gladstone formed his first ministry Peel served as parliamentary secretary to the Poor Law Board (1868-71), as secretary to the Board of Trade

(1871-73), and as patronage secretary to the Treasury (1873-74), i.e., the whip of his party. In 1880 he held an undersecretaryship in the Home Department. In 1895 he was raised to the peerage and in 1904 was chairman of the British Commission to the St. Louis Exposition.

PEEL, PAUL (1860-92). A Canadian genre and landscape painter, born in London, Ontario. He studied at the Pennsylvania Academy of Fine Arts, the Royal Academy, London, and in Paris under Gérôme and Benjamin Constant. He achieved great skill as a colorist, especially in flesh tints as shown in nude children, his favorite subjects being scenes from child life, but he also painted landscapes with fine light effects. In 1890 he was awarded a gold medal in Paris for "After the Bath," which was acquired by the National Gallery at Budapest, Hungary. Queen Alexandra bought his "Two Friends" for Buckingham Palace, and "Fording the Stream" hangs in the City Hall, Toronto.

PEEL, SIR ROBERT (1788-1850). An eminent British statesman. He was born near Bury, Lancashire, on Feb. 5, 1788, the eldest son of Robert Peel (created Baronet in 1800), a wealthy cotton spinner. Peel was educated at Harrow and at Christ Church, Oxford, graduating from the latter in 1808, with a first class in classics and in mathematics. He subsequently studied law at Lincoln's Inn. In 1809 he obtained a seat in the House of Commons for the close borough of Cashel and began his political career by supporting the Tory ministry of the Duke of Portland. In 1810 he was appointed Undersecretary for War and the Colonies. In 1812, Lord Liverpool having meanwhile become Prime Minister, Peel became Chief Secretary for Ireland. In this capacity he had to consider three great questions—patronage, the preservation of order, and the maintenance of the Protestant ascendancy. In order to carry out these affairs successfully Peel ignored all personal ends and appointed Catholics and Protestants alike, thus strengthening his party. He created the Irish constabulary, dubbed Peelers, and became involved in such a bitter contest with Daniel O'Connell (q.v.) that he was driven in 1815 to send the agitator a challenge. The police, however, prevented the duel from taking place. Peel remained Irish Secretary until 1818, when he resigned. He had been chosen in 1817 the representative of Oxford in Parliament, an unusual honor for so young a man. He also began about this time to acquire a reputation as a financier and economist, and in 1819 he was appointed chairman of a special committee to consider the state of the Bank of England. As a result the so-called Peel's Act was adopted, according to which specie payments were resumed on May 1, 1823.

Peel had been a vigorous opponent of all acts intended to emancipate the Catholics, but about this time his views gradually began to change, though the process was so slow that after he had reentered the ministry at the close of 1821 as Home Secretary he continued to oppose the measures of Canning, the most powerful advocate of the Catholics, and in 1827, after Canning had become Prime Minister, Peel resigned. In 1828 he again became Home Secretary in the cabinet of the Duke of Wellington. By this time Peel decided to support Catholic emancipation, and on March 5, 1829, himself introduced a bill to effect this change, which soon became a law. As a result of this reversal of his views

Peel no longer remained the representative of Oxford, but sat for Westbury and subsequently for Tamworth. He brought about at this time numerous reforms in the laws, and in 1829 established a police force in London similar to that which he had established in Ireland.

In November, 1830, the cabinet was defeated on the question of parliamentary reform, and Peel for the first time belonged to the Opposition. He vigorously attacked the Reform Bills and played an important part in the various dramatic episodes of that time. On Dec. 9, 1834, he became Prime Minister, and tried to carry on the government in the face of a hostile majority, but on April 8, 1835, he was compelled to give up the contest. He began slowly, but surely, to build up the great Conservative party, so called since 1831, and gathered together under his leadership young men like Disraeli and Gladstone. In 1839 the Conservative leader was summoned on one occasion to form a cabinet, but Queen Victoria refused to submit to changes in the personnel of her household, and so the Whigs remained in power. They were, however, pressed on the one side by the new Radical party and the Anti-Corn Law League and on the other by O'Connell. They lost ground and in 1841 were compelled to dissolve Parliament. The general election that ensued was virtually a contest between free trade and protection, and the latter won. When the new Parliament met the Conservative party, headed by Peel, came into office. The Whigs desired a fixed and moderate duty on foreign corn; the Anti-Corn Law League wished free corn; while Peel was in favor of a modification of the sliding scale of duty which had existed since 1828. He introduced and carried in 1842, in spite of strong opposition, a measure based upon this principle. The deficit in the revenue, which had grown to about £2,000,000, next engaged his attention and led him to bring in a bill (1842) for the imposition of an income tax of 7d. in the pound, to be levied for three years on all incomes of £150 or more. To equalize still further the burdens of taxation, Peel commenced a revision of the general tariff and either abolished or lowered the duties on several very important articles of commerce. The great Bank Charter Act of 1844 was the measure to which Peel himself felt most attached and which he considered the most important and far-reaching of his administration. He also showed himself resolute in the repression of the malcontents of Ireland. O'Connell (q.v.) was tried for conspiracy, and though the judgment against him was set aside on appeal to the House of Lords, the influence of the agitator was broken. The first half of 1845 was marked by the increase of the allowance to Maynooth and its change into a permanent endowment instead of an annual grant, and by the foundation of the Irish nonsectarian colleges and other important measures. The potato rot in Ireland during the autumn, followed by a frightful famine, rendered cheap corn a necessity, if millions were not to starve. Cobden and the League redoubled their exertions. Lord John Russell announced the views of the Liberal party on the crisis, and Peel finally yielded. He told his ministerial colleagues that the Corn Laws were doomed and their repeal was inevitable. Some of them refusing to go along with him, he resigned; but after a few days he was recalled and the repeal was carried. He was, however, immediately

afterward defeated on a protection of life bill for Ireland. Not so much upon this account as because he felt that the course which he had pursued had produced a dissolution of the old ties of party and that he could not expect for some time to find himself at the head of a strong government, Peel retired from office in June, 1846, giving place to a Liberal administration under Lord John Russell, to which he gave an independent but general support as the leader of a middle party rather than Liberal or Conservative. In the critical times of 1847-48 he was one of the most important props of the government, whose free-trade principles he had now completely accepted. His ecclesiastical policy had also undergone a remarkable change, and he now frankly supported the Liberals in their efforts to carry an act for the repeal of the Jewish disabilities. On June 28, 1850, he spoke with great eloquence in the debate on Lord Palmerston's Greek policy. On the following day he was thrown from his horse in Hyde Park and was so much injured that he died on the evening of July 2, 1850.

Bibliography. The best authorities for a study of Peel are: *Collection of Speeches Delivered in Parliament* (4 vols., London, 1853); Stanhope and Cardwell, *Memoirs of Peel* (ib., 1857); *Sir Robert Peel: His Life and his Private Correspondence*, edited by C. S. Parker (3 vols., ib., 1891). A number of biographies of Peel exist. Among the best may be named: Taylor and Mackay, *Life and Times of Sir Robert Peel* (London, 1846-50); Thomas Doubleday, *The Political Life of Sir Robert Peel* (ib., 1856); Sir Lawrence Peel, *Life and Character of Sir Robert Peel* (ib., 1860); F. P. G. Guizot, *Sir Robert Peel: Etude d'histoire contemporaine* (ib., 1856); also J. R. Thursfield, *Peel*, in "Twelve English Statesmen Series" (ib., 1891); Walter Bagehot, "The Character of Sir Robert Peel," in *The English Constitution and Other Political Essays* (New York, 1903); Bernard Holland, *The Fall of Protection, 1840-1850* (London, 1913).

PEELE, GEORGE (c.1558-c.1597). An English dramatist. He was educated at Christ's Hospital School, where his father was a clerk, and at Christ Church, Oxford, graduating B.A. in 1577 and M.A. in 1579. On returning to London he was driven from the precincts of Christ's Hospital owing to his dissipated conduct. He seems to have been a skillful player as well as a playwright. His chief plays are the *Arraignement of Paris*, performed before the Queen probably in 1581; *Edward I* (printed 1593), one of the earliest historical plays in English; *The Battle of Alcazar* (printed 1594); *The Old Wives' Tale* (printed 1595); and the richly Oriental *David and Bethsabe* (printed 1599). Though Peele's dramatic work has less importance than Greene's and Marlowe's, it yet helped prepare the way for Shakespeare. Peele wrote some pageants also, and among his miscellaneous writings are "An Eclogue Gratulatory," addressed to the "Renowned Shepherd of Albion's Arcadia, Robert, Earl of Essex," and "The Beginnings, Accidents, and End of the Fall of Troy," important because Shakespeare may have got from it the idea of treating fully the theme of *Troilus and Cressida*. As a dramatist Peele lacked constructive skill and cannot be counted the equal of some contemporary Elizabethans. In the development of the English drama he was cer-

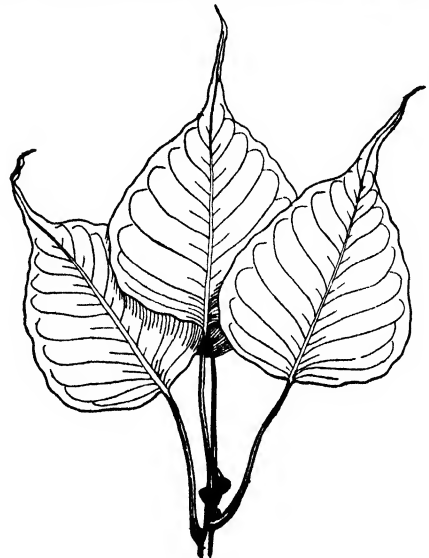
tainly not so influential as Greene or Marlowe. His blank verse in general is facile and remarkably fluent, but only at moments powerful and impressive. Though certain of his lyrics are beyond praise and of a freshness and charm that defy criticism, in lyric as in dramatic poetry he cannot be placed in the first rank. Consult his *Works*, edited by Bullen (London, 1888), and Ward, *History of English Dramatic Literature*, vol. i (ib., 1875).

PEENE, PÂNE, HIPPOLIET JAN VAN (1811-64). A Flemish dramatist. He was born at Caprijcke in East Flanders, studied medicine at Louvain, and practiced in Ghent from 1837 to his death. Besides a popular song, *De vlaamsche Leeuw*, for which the music was written by Karel Miry, Peene's work was for the stage. As early as 1835 he had written a French vaudeville, *La vieillesse de Stanislas*. His *Kaiser Karel en de berchemside Boer* (1847) is the first example in Flemish of the same genre. Of his later plays the more important are: *Brigitta* (1847), an opera; *Jan de Vierde* (1848), an historical drama; *Vader Cats* (1855); *Jellen en Mietje* (1858); as well as texts for French opera. His collected works in 38 volumes appeared at Ghent (1880-82).

PEEP'ER. One of the small tree frogs which in early spring are heard peeping all over the country as the sexes gather in the ponds and puddles for breeding purposes. The first voice heard in this chorus of early March in the northern United States is that of Pickering's or the little yellow tree toad (*Hyla pickeringii*). In the Southern States a small greenish peeper, very common, is *Hyla squirella*.

PEEPING TOM OF COVENTRY. The only person in Coventry who disobeyed the injunction not to look out on the street while Lady Godiva (q.v.) rode by. The name has become a conventional term for an inquisitive person.

PEEPUL, PIPUL, or PIPPUL, pē'pūl (Hind. *pipal*, from Skt. *pippala*, long pepper,



PEEPUL.

sacred fig tree), *Ficus religiosa*. A species of fig (q.v.) known in Ceylon as the bo tree. It

somewhat resembles the banyan, but the branches do not root like those of that tree, and the leaves, rounded at the base, have long attenuated points which are considered special devices for carrying off the water from leaves, a necessary device in wet tropical forests. The tree, which often attains a height of 100 feet or more, is held sacred by the Hindus. (See *BO TREE*.) It is often planted for shade near houses and by the side of walls. The juice contains caoutchouc and is used by women as bandoline. Lac insects feed upon the tree, and much lac is obtained from it. The fruit is not much larger than a grape and, although edible, is not valued.

PEER (OF. *per*, *pair*, Fr. *pair*, peer, equal, from Lat. *par*, equal). A general name applied to the various members of the titled nobility of England. The peerage comprises the ranks of duke, marquis, earl, viscount, and baron. The dignity of the peerage, still hereditary, was in early times also territorial. Life peerages seem to have been not unknown at one time in England; but in 1856, in the case of the law lord Baron Wensleydale, the House of Lords ruled that his creation "for and during the term of his natural life" did not convey the privilege of a seat and a vote in their House. Women may be peeresses in their own right, either by creation or by inheritance. In France the great vassals of the crown were very early known as peers, while the legal fiction of a semi-equality with the King was still maintained; the title occurs under Robert I and Louis VII, though the earliest letters patent creating a peerage which are known are those issued by Philip IV in favor of Robert II, Count of Artois. Under Philip Augustus there were six lay peers and six ecclesiastical. When three of the lay peerages were extinguished by union with the crown, the King created new ones, at first of the blood royal, to counterbalance the ecclesiastical peerages. The policy of Richelieu and Louis XIV reduced the prerogatives of the peerage to a simple question of precedence, the debates over which occupy such a large part of Saint-Simon's memoirs. Their only privilege was that of sitting in the parliaments and being judged only by these high courts. At the Revolution there were 49 peerages, including five princes of the blood, six spiritual peers (the same archbishops as in the Middle Ages), and 38 lay peers, ranging in seniority from Uzès, 1572, to Aubigny, Choiseul, and Coigny, 1787. The peerage was then suppressed. From 1814 to 1848 a House of Peers was in existence, modeled on the English Upper House. Hereditary succession was abolished in 1830.

PEER GYNT, pã'ër gunt, or yunt. A dramatic poem by Henrik Ibsen (1867). It has been called the Scandinavian *Faust*. Grieg composed a suite named from the poem and suggested by its theme.

PEERLKAMP, pãrl'kãmp, HOFMAN PETER (1786-1865). A prominent Dutch Latinist and critic. He was born at Groningen, studied there and at Leyden, where, after teaching in Haarlem and Dockum, he became professor of classics and ancient history (1822). This chair he resigned in 1848 because of ill health. As a classical scholar he had a remarkably brilliant style and a purely subjective standard of criticism which led him to judge as interpolations much of Latin poetry. Peerlkamp edited Horace's *Odes* (1834; 2d ed., 1862), his most famous work; Vergil's *Æneid* (1843); Horace's *Ars Poetica*

(1845) and *Satires* (1863), as well as Tacitus' *Agricola* (1827; 2d ed., 1864) and the works of Xenophon of Ephesus (1818); and he wrote much on the history of Dutch literature and classical scholarship. He founded (1825) the *Bibliotheca Critica Nova*. Consult Leopold, *Studia Peerlkampiana* (Groningen, 1892), and J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

PEERS, RICHARD (1645-90). An English author and translator. He was the son of a tanner and was born in Lisburn in the County of Antrim, Ireland. Disliking his father's trade, to which he was apprenticed, he ran away to England, where he was sent to school by an uncle. He graduated B.A. from Christ Church, Oxford, in 1668, and M.A. in 1671. In recognition of his scholarship he was elected esquire bedell in the faculty of arts (1675) and afterward in the faculty of physic. Under the supervision of Dr. John Fell (q.v.) he translated into Latin Anthony à Wood's *History and Antiquities of Oxford* (1674); unaided made the first catalogue of Oxford graduates under the title of *A Catalogue of Graduates in Divinity, Law, and Physic, etc.* (1689); and contributed to the famous *English Atlas* (vol. iv) of Moses Pitt, *The Description of the Seventeen Provinces of the Low Countries or Netherlands* (1682). He also published *Verses on Sundry Occasions* (1667). His life was passed in and near Oxford.

PEERYBIN'GLE, Mrs. In Dickens's *Cricket on the Hearth*, the devoted and cheery little wife of John Peerybingle. Her husband called her *Dot*, under which name Dion Boucicault's dramatization of the story was presented in 1862.

PEET, HARVEY PRINDLE (1794-1873). An American educator, born at Bethlehem, Conn. He graduated at Yale in 1822 and two years later became superintendent of the American Asylum for the Education of the Deaf and Dumb, the first institution of the kind in America. In 1831 he became president of the New York Institute for the Deaf and Dumb. He was the author of *A Course of Instruction for the Deaf and Dumb* (1844-46), *Legal Rights of the Deaf and Dumb* (1856), and of several other works on deafness and on insanity.

PEET, STEPHEN DENISON (1830-1914). An American archaeologist, born at Euclid, Ohio. He graduated at Beloit College in 1851, studied at Yale Divinity School (1851-53), and graduated from Andover Theological Seminary in 1854. Thereafter until 1895, when he removed to Chicago, he held various pastorates in Congregational churches in Wisconsin, Ohio, and Illinois. He founded in 1878 and thereafter was editor of the *American Antiquarian and Oriental Journal*. He also published: *The Clan Centres and the Clan Habitat of the Effigy Builders* (1891); *The Mound Builders: Their Work and Relics* (1892; 2d ed., 1903); *The History of the Explorations in the Mississippi Valley* (1896); *Prehistoric America* (3 vols., 1890-99); *Ancient Monuments and Ruined Cities* (1904); *Myths and Symbols* (1905); *Aboriginal Religions in America* (1905).

PEEWEE. See PEWEE; Plate of FLY-CATCHERS, and Colored Plate of EGGS OF AMERICAN SONG BIRDS.

PEE'WIT. See LAPWING.

PEFFER, WILLIAM ALFRED (1831-1912). An American journalist, legislator, and author, born in Cumberland Co., Pa. In 1853 he settled

in Indiana, in 1859 in Missouri, and later in Illinois. He enlisted in the Eighty-third Illinois Regiment in 1862, was mustered out as lieutenant in 1865, and, removing to Kansas, established the *Fredonia Journal* and the *Coffeyville Journal*. He had studied law while in the army, was admitted to the bar in 1865, and thereafter he was both journalist and lawyer. In 1874 he was elected to the State Senate, in 1880 was a Republican presidential elector, and in 1881 assumed the editorship of the *Kansas Farmer*. From 1891 to 1897 he represented the People's party in the United States Senate, being elected over John J. Ingalls, and in 1898 was nominated by the Prohibitionists for Governor of Kansas. After the expiration of his term he engaged in statistical and compilation work for Congress. As Senator and writer he maintained that "the farmers by virtue of their vocation ought to control the politics of this country." Among his publications are: *Peffer's Tariff Manual* (1888); *The Way Out* (1890); *The Farmer's Side* (1891); *Americanism and the Philippines* (1900); *Rise and Fall of Populism in the United States* (1900).

PEGASUS. A northern constellation lying southwest of Andromeda. It was supposed by the ancients to represent the winged horse which sprang from the blood of Medusa. The four bright stars, α , β , and γ Pegasi, and α Andromeda, outline the "great square of Pegasus" and render the constellation easy of detection.

PEGASUS (Lat., from Gk. Πήγασος; connected with πηγός, *pēgos*, strong, πηγύναι, *pēgynai*, to fasten; popularly derived from πηγή, *pēgē*, spring). In Greek legend, a winged horse, begotten by Poseidon from the Gorgon Medusa, and with Chrysaor springing from her neck when she was beheaded by Perseus. Later, by the aid of Athena, he was caught at the spring Pirene, in Corinth, by Bellerophon (q.v.), who used him in his conflict with the Chimæra (q.v.) and in his later wars. Afterward he was said to have flown to heaven, and later writers told how he had been placed among the stars. The Alexandrian poets seem to have been the first to attribute the spring Hippocrene on Mount Helicon to a blow of Pegasus' hoof, and the same story is found in connection with Aganippe and several other fountains in Greece. This story brought Pegasus into connection with the Muses of Mount Helicon, and as the spring-inspired poets we find them honoring Pegasus for his gift. As the horse on which the poet is carried from the earth into the realms of poetic fancy, Pegasus is unknown to antiquity. That conception seems to appear first in Boiardo's *Orlando innamorato*. Consult F. Hannig, "De Pegaso," in *Breslauer philologische Abhandlungen*, vol. viii (Breslau, 1902).

PEG-GOTTY. The name of a family in Dickens's *David Copperfield*, consisting of Clara, who married Barkis the carrier, her brother Dan, and nephew Ham, Yarmouth boatmen, who live in a remodeled barge with Little Emily and Mrs. Gummidge.

PEGMATITE (from Gk. πήγμα, *pēgma*, anything fastened together, from πηγύναι, *pēgynai*, to fasten). A coarse-grained rock of siliceous composition occurring in dikes or veins and generally in association with a parent mass of granite rock. Most pegmatites have the composition of a siliceous granite. They are made up chiefly of feldspar (orthoclase, microcline, plagioclase), quartz, and muscovite; but they

are also the home of many of the minerals containing rarer chemical elements, such, e.g., as boron, beryllium, uranium, cerium, etc. Pegmatites supply feldspar, which is used in porcelain and China ware and for other purposes, and mica, which finds many valuable applications. They are found by igneous agencies, being usually offshoots of some granite magma.

PEGOUD, pe-gō', ADOLPHE (1889-1915). A French aviator. He first attracted general attention in 1913 by originating the feat of flying upside down, diving through the air in spectacular fashion and, for the first time, "looping the loop" in an air craft. He used a Blériot monoplane. Pegoud had intended to visit the United States in 1914, but when the European War broke out he joined the French aviation corps. In August, 1914, his machine was riddled by the shots of the enemy; in March, 1915, he received the French military medal; and in the following month he performed a notable feat by destroying a German Taube and taking prisoners its pilot and observer. Altogether he had brought down six German air craft before he himself was killed.

PEGGRAM, GEORGE HERNDON (1855-). An American civil engineer, born at Council Bluffs, Iowa. After graduating from Washington University in 1877, he engaged in railroad and bridge engineering. He served as chief engineer of the Edge Moor Iron Company of Wilmington, Del., in 1880-86, as consulting engineer of New York City in 1886-89 and of the Missouri Pacific Railroad in 1889-93, and as chief engineer of the Union Pacific System in 1893-98, and, in New York City, of various transit interests after 1898. Pegram designed the Kansas City Elevated Railroad and the St. Louis Union Station, invented and patented in 1889 the Pegram truss for bridges, and in 1890 built the bridge across the Arkansas River at Fort Smith, Ark.

PEGGRAM, JOHN (1832-65). An American soldier, born at Petersburg, Va. He graduated at West Point in 1854 and was assigned to frontier duty with the First Dragoons. On Feb. 28, 1857, he was appointed first lieutenant. He served as assistant instructor of cavalry and took part in the Utah expedition of 1857-58. From 1858 to 1860 he was on leave, traveling and studying in Europe, and on his return served against the Indians in New Mexico. He resigned on May 10, 1861, and became a captain of cavalry in the Confederate army. In June and July he was lieutenant colonel in General Garnett's operations around Beverly in West Virginia and was captured at Rich Mountain (July 11). When exchanged, he was sent in July, 1862, to General Bragg in Mississippi as chief of engineers and afterward was chief of staff for Gen. E. Kirby Smith in Tennessee. He was made brigadier general of cavalry in November, 1862, was engaged at Murfreesboro, and commanded a division at Chickamauga. He was transferred to the Army of Northern Virginia, Early's division, Second Corps, and repulsed an attempt to turn the right Confederate flank at the Wilderness. He served in the campaign against Sheridan in the Shenandoah in the fall of 1864 and was promoted major general. While on service around Richmond he was mortally wounded in the skirmish at Hatcher's Run in February, 1865.

PEGU, pé-gō'. A division of Lower Burma (q.v.), British India. Area, 13,258 square miles.

It comprises the districts of Pegu, Rangoon City, Hanthawaddy, Tharrawaddy, and Prome. It is watered by the Irrawaddy, the Rangoon, the Pegu, and the Sittang. The surface is uneven, attaining in the Aracan Yoma Mountains, on the west boundary, a maximum altitude of about 6000 feet. The climate is warm and humid, but not unhealthful. The soil is fertile, the river valleys are well cultivated and highly productive, and there are extensive forests of valuable trees. Rice is the principal crop, and teak timber is largely exported. The Peguans belong by race to the Mons (q.v.). Pop., 1901, 1,820,638; 1911, 2,073,737. Pegu was an independent Talaing kingdom until 1752; its subsequent history is merged with that of Burma (q.v.). It became British in 1862.

PEGU. The capital of a division of south Burma, on the Pegu River, 47 miles northeast of Rangoon (Map: Burma, C 3). It has a remarkable pagoda with a tower 324 feet high. Before its destruction by Alompsa in 1757 it was said to be a large, fine city of more than 100,000 inhabitants. There are a colossal recumbent figure of Buddha, and many ancient relics. Pop., 1901, 14,132; 1911, 17,104.

PÉGUY, pé'gu'é, CHARLES (1873-1914). A French poet and sociological writer, born at Orléans and killed in battle Sept. 5, 1914. He studied at the lycées of Orléans, Lakanal, and Louis-le-Grand and entered the Ecole Normale Supérieure in 1894. He began writing in 1897 under the pseudonym of Pierre Deloivre, using also that of Pierre Baudoin, and at the same time served as director of a Socialistic library. His struggle for the revision of the Dreyfus case brought him notoriety. In 1900 Péguy began publishing the *Cahiers de la Quinzaine*, interrupted in August, 1914, by the War. In this collection containing most of Péguy's work, we can follow his moral evolution. He will be best known probably for his beautiful, idealistic studies of Joan of Arc. He wrote: *De la cité socialiste* (1897); *Jeanne d'Arc, drame en trois actes: Domremy; les Batailles; Rouen* (1897); *Marcel, premier dialogue de la cité harmonieuse* (1898); *Notre jeunesse* and *Le mystère de la charité de Jeanne d'Arc* (both 1910); *Victor-Marie, comte Hugo*, and *Œuvres choisies*, prose (1911), crowned by the French Academy; *Le mystère des saints Innocents*; *Le porche du mystère de la deuxième vertu* and *De l'argent* (1912); *La tapisserie de Sainte-Geneviève et de Jeanne d'Arc* and *La tapisserie de Notre-Dame* (1913); *Choix de poésies* (1914).

PEHLEVI, pā'lā-vē, more correctly pā'r'lā-vē. See PAHLAVI LANGUAGE AND LITERATURE.

PEI-CHING, pā'ching'. See PEKING.

PEI-HO, pā'hō' or pī'hō' (Chin., white river). The most important river of north China (Map: China, L 4). It rises near the Great Wall north of Peking, flows southward, receiving several tributaries, past Tunghowfu, 12 miles east of Peking, to Tientsin, where it takes a southeastern course and falls into the Gulf of Pechili at Taku (q.v.), its course being wholly within the Province of Chili. At Tientsin it receives from the northwest the Hun-ho, swollen by the accession near its confluence with the Pei-ho of the waters of many rivers, with numerous feeders, from the west and southwest. Here, also, it connects with the Grand Canal. Its course is very tortuous, especially below Tientsin, the distance from that point to Taku by water being 80 miles, but only 35 by land. Its waters are

thick with silt, but are navigable by coast and river steamers as far as Tientsin and by native vessels above that point to Tunghowfu. There is a bar of stiff clay at its mouth, which greatly impairs its value as a waterway, and the water along the coast is so shallow that heavily laden vessels cannot approach nearer than 8 miles. The total length of the river is estimated at 350 miles.

PEILE, pēl, JOHN (1838-1910). An English philologist, born at Whitehaven, Cumberland. He studied at Christ's College, Cambridge, where he was fellow and lecturer in 1860 and in 1887 master. Peile took much interest in university extension and in the higher education of women. He published: *Introduction to Greek and Latin Etymology* (1869) and *Primer of Philology* (1877), both popular works; *Notes to the Tale of Nala* (1881); and a *History of Christ's College* (1910).

PEINE, pī'ne. A town in the Province of Hanover, Prussia, on the Fuse, 20 miles east of Hanover. It is a grain and cattle market, has breweries and manufactures iron, steel, sugar, furniture, malt, vinegar, textiles, and fertilizer. Pop., 1900, 15,400; 1910, 16,667.

PEINE FORTE ET DURE, pān fōrt à dur (OF., strong and hard punishment). A punishment formerly imposed by the laws of England upon persons who, on being arraigned for felony, refused to plead, stood mute or peremptorily challenged more than 20 jurors, which was considered a contumacy equivalent to standing mute. By the early English law an accused person must plead "guilty" or "not guilty" before he could be tried, and the form of coercion hereinafter described was devised to force an accused person to plead in case of his obstinate refusal.

In the beginning of the thirteenth century the penalty consisted merely of a long imprisonment and a low diet, persisted in until the prisoner submitted. However, by the reign of Henry IV it had become the practice to lay the accused on his back on a bare floor, place on his body as great a weight of iron "as he could bear, and more," and give him only the "worst" bread and water from the nearest stagnant pool until he consented to plead or died. During the fifteenth, sixteenth, seventeenth, and even the eighteenth centuries a number of cases are recorded of the infliction of the above punishment for "standing mute" on an arraignment for felony.

This form of coercion of a plea was finally abolished in 1772, by Stat. 12, Geo. III, c. 20, which provided that "standing mute" on an arraignment for felony should be considered as equivalent to conviction. This harsh rule was altered by Stat. 7-8, Geo. IV, c. 28, by the humane provision that a plea of "not guilty" should be entered in case of the refusal of a prisoner to plead, and this rule prevails everywhere to-day.

American records are stained by only one well-authenticated instance of the infliction of this torture. One Giles Cory, accused of being a witch, refused to plead on his arraignment and was pressed to death at Salem, Mass., in 1692. Consult Sir J. F. Stephen, *History of the Criminal Law of England* (3 vols., London, 1883).

PEIPUS, pī'pōs (Russ. Tchudskoye Ozero). A large lake in the Baltic Provinces of northwest Russia. It lies 30 miles south of the Gulf of Finland, into which it is drained through

the Narova River (Map: Russia, C 3). It is 45 miles long and 20 miles broad and connects southward through a narrow channel with Lake Pskov. Its banks are low and sandy and for the greater part wooded, and it is rich in fish, which supply the markets of St. Petersburg. The lake is deep enough (30 feet on the average, with a maximum of 90) for large vessels and is navigated by steamers. It was formerly the chief waterway between the Hanse towns of the Baltic and the interior of Russia.

PEIRCE, pērs, BENJAMIN (1809–80). An American mathematician and astronomer, born at Salem, Mass., April 4, 1809. He graduated at Harvard College in 1829. He became tutor there in 1831, professor of mathematics and physics in 1833, and Perkins professor of mathematics and astronomy in 1842, which position he held till his death. In 1849 he became consulting astronomer to the *American Ephemeris and Nautical Almanac*, and in 1855 one of the council to organize the Dudley Observatory, Albany. In 1867 he succeeded Prof. A. D. Bache as superintendent of the Coast Survey, in which service he continued till 1874. In his early life he was a contributor to the *Mathematical Miscellany* and also published the *Cambridge Miscellany of Mathematics, Physics, and Astronomy*, in which appeared his celebrated investigation of the motion of a top spinning on a plane surface. He also prepared a series of mathematical textbooks for the use of the university, and it was chiefly by his exertions that the Harvard Observatory was established and perfected. In 1851 he published in the *Astronomical Journal* a series of remarkable papers on the constitution of Saturn's rings, in which he considered the conditions of statical equilibrium of a transverse section of the ring and came to the conclusion that if there are separate rings they must be more numerous than Laplace had even supposed. (See SATURN.) In 1857 he published his *System of Analytical Mechanics*. Among his important contributions to mechanics may be mentioned his investigation of the forms of an elastic sac containing a fluid, a subject which led to the theory of analytic morphology. His contributions to mathematics are of the broadest and profoundest character. They are principally embraced in certain communications on *Linear Associative Algebra* to the National Academy of Sciences, which had been suggested by the publication by Hamilton in 1852 of his quaternions. These communications were collected in 1870, and 100 lithograph copies were published. They were reprinted in the *American Journal of Mathematics* (1882). Peirce was a member of various learned societies in Europe and America and in 1853 was president of the American Association for the Advancement of Science. He died at Cambridge, Mass., Oct. 6, 1880.

PEIRCE, BENJAMIN OSGOOD (1854–1914). An American mathematician and physicist, born at Beverly, Mass. He graduated at Harvard in 1876, studied in Leipzig and Berlin after acting as assistant in physics at Harvard for a year, taught in the Boston Latin School in 1880–81, and at Harvard was instructor (1881–84), assistant professor of mathematics and physics (1884–88), and then Hollis professor of mathematics and natural philosophy. In 1912 he was elected president of the American Physical Society. He contributed to the *Proceedings of the American Academy of Sciences* many papers on

magnetism, electricity, and heat and published *Elements of the Theory of the Newtonian Potential Function* (1886; 3d ed., 1906), and *A Short Table of Integrals* (1889; 2d rev. ed., 1910; abridged ed., 1914).

PEIRCE, BRADFORD KINNEY (1819–89). An American Methodist Episcopal clergyman and social worker, born at Royalton, Vt. Graduating at Wesleyan University, Connecticut, in 1841, he joined the New England Conference five years later. He was editor of the *Sunday-School Messenger* and *Sunday-School Teacher* (1844–45), agent of the American Sunday School Union (1854–56), Massachusetts State Senator (1855–56), and superintendent and chaplain of the State Industrial School, Lancaster, Mass. (1856–62). For 10 years he served as chaplain of the house of refuge on Randall's Island, New York, then for 16 years as editor of *Zion's Herald*, and in 1889 as financial agent for Boston University. He wrote: *The Bible Scholar's Manual* (1847); *Notes on the Acts* (1848); *The Eminent Dead* (1851); a series of question books for Sunday-school scholars (1849–52); *Trials of an Inventor* (1866); *The Word of God Opened* (1868); *A Half Century with Juvenile Delinquents* (1869).

PEIRCE, CHARLES (SANTIAGO) SANDERS (1839–1914). An American physicist and philosopher, born at Cambridge, Mass. He graduated at Harvard in 1859 and at the Lawrence Scientific School in 1863. Entering the United States Coast Survey, in 1872 he conducted a valuable series of pendulum experiments to determine the density and shape of the earth. He also studied the problem of wave lengths of light in connection with L. M. Rutherford. Professor Peirce was a lecturer on logic at Johns Hopkins and Harvard universities and in Lowell Institute courses in Boston. In 1876 he was elected a member of the National Academy of Sciences. He is author of *Photometric Researches* (1878), *Studies in Logio* (1883), and many special articles on logic and other subjects. It was Peirce who, according to William James, first introduced the term "pragmatism" into philosophy (1878), in an article entitled "How to Make our Ideas Clear" (*Popular Science Monthly*, January, 1878; Fr. trans., *Revue Philosophique*, January, 1879). James says, however: "The principle lay entirely unnoticed by any one for 20 years until I, in an address before Professor Howison's Philosophical Union at the University of California, brought it forward again and made a special application of it to religion."

PEIRCE, GEORGE JAMES (1868–). An American botanist. He was born at Manila, Philippine Islands, graduated from the Lawrence Scientific School (Harvard) in 1890, and in 1892–94 studied at the universities of Bonn, Leipzig (Ph.D., 1894), and Munich. After two years as assistant professor of botany at Indiana University he was assistant professor (1897–1900), associate professor (1900–10), and thereafter professor of botany at Leland Stanford. Peirce served as collaborator of the United States Forest Service in 1909–10 and as a special agent of the Department of Justice in 1910–11. He is author of *Textbook of Plant Physiology* (1903).

PEIRCE, JAMES MILLS (1834–1906). An American mathematician, born at Cambridge, Mass. He graduated at Harvard in 1853 and after several years of tutoring became an assist-

ant professor of mathematics there in 1861. In 1869 he became full professor and in 1885 was appointed Perkins professor. He served also as dean of the graduate school in 1890-95 and as dean of the faculty of arts and sciences in 1895-98. Among his publications are: *Text-Book of Analytic Geometry* (1857); *Three and Four Place Tables of Logarithmic and Trigonometric Functions* (1871); *The Elements of Logarithms* (1874); *Mathematical Tables, Chiefly to Four Figures* (1879).

PEIROL, pá'ról' (?-c.1150). A French troubadour, so called from his birthplace, Peirol in Auvergne. The Dauphin, Robert of Auvergne, received him at his court. But there Peirol met and loved Robert's sister, Assalide, or Sail de Claustra as he calls her in his verse, and according to the Provençal *Life* of the poet for a time lived at court as her favorite with Robert's knowledge, but was finally exiled by the jealous Dauphin. In the Crusade of 1189 he seems to have taken an active part. On his return he lived at Montferrat, whence in all probability he made a pilgrimage to the East. If we are to believe the manuscript *Life*, he settled at Montpellier and there married and died. His poems, 30 canzones and his part of a few tenzons, are especially valuable as contributions to the history of the spirit of the Crusades.

PEISANDER. See PISANDER.

PEISHEVA, pá'she-vá. See PESHWA.

PEISIS/TRATUS. See PISISTRATUS.

PEIXOTO, pá-shô'tô, FLORIANO (1842-95). A Brazilian soldier and politician, born at Pico, Alagôas. He entered the army as a private, rose rapidly, and distinguished himself in the war with Paraguay. In 1889 he assisted Fonseca in establishing the Republic and after serving as Minister of Finance was elected Vice President in 1891. Fonseca resigned from the presidency in the same year, and Peixoto took his place. As leader of the military party, he endeavored to perpetuate the militarism of his predecessor and failed to work in harmony with Congress. In 1893 a formidable naval revolt against the administration of Peixoto broke out under the leadership of Admirals Custodio de Mello and Saldanha da Gama (qq.v.), accompanied by an insurrection in Rio Grande do Sul. The revolution was crushed after eight months of bloody fighting, and in 1894 Peixoto surrendered the presidency to Prudente de Moraes Barros. Consult Luiz José Pereira da Silva, *Florianô Peixoto* (Rio de Janeiro, 1894). See BRAZIL.

PEIXOTO, IGNACIO JOSÉ DE ALVARENGA (1744-93). A Brazilian poet, born in Rio de Janeiro. He was educated in Portugal at the University of Coimbra and served as district judge at Cintra. He returned to Brazil in 1776 and was made a judge in São-João-d'El-Rei, in the interior Province of Minas Geraes. He was also a cavalry colonel and in 1789 was one of the 12 arrested for implication in the republican plots. Kept for two years in a dungeon without trial, his death sentence was commuted to deportation to Angola in Portuguese Africa. Some of his poems, which rank among the best in the Portuguese tongue, were published in Paris in 1865, under the title *Obras poeticas, colligidas, annotadas, precedidas de juizos criticos, e de uma noticia sobre o auctor e suas obras, com documentos historicos, por J. Norberto de Sousa S.*

PEIXOTTO, pêsh-ô'tô, ERNEST CLIFFORD

(1869-). An American decorative, architectural, and landscape painter, also an author. He was born in California and studied in Paris under Benjamin Constant and Lefebvre. He lived many years in Europe, exhibiting frequently at the Paris Salon, and in later years exhibited also in America. Among his best paintings are the "Woman of Rijsoord" (1895) and a mural frieze, "Le morte d'Arthur," for the library of Henry Everett, near Cleveland (1911). Besides contributing to *Scribner's Magazine* and other periodicals, he illustrated Roosevelt's *Life of Cromwell* and published, with his own illustrations, *By Italian Seas* (1906), *Through the French Provinces* (1910), *Romantic California* (1911), and *Pacific Shores from Panama* (1913). He became an associate of the National Academy in 1909. Peixotto excels in outdoor effects and in architectural drawings that show great accuracy and artistic feeling, with a leaning towards impressionism.

PEK'AN, or PENNANT'S MARTEN. See FISHER.

PEKEA (pê-kê'a) **TREE**. A tropical American tree. See CARYOCAR.

PEKIN. The capital of China. See PEKING.

PE'KIN. A city and the county seat of Tazewell Co., Ill., 9 miles south by west of Peoria, on the Illinois River and on the Cleveland, Cincinnati, Chicago, and St. Louis, the Chicago and Alton, the Illinois Central, the Atchison, Topeka, and Santa Fe, the Chicago, Peoria, and St. Louis, and other railroads (Map: Illinois, E 4). It has a public library, Mineral Spring Park, and fine government, court, and public-school buildings. In the vicinity are productive veins of coal and fertile agricultural lands. The city is a noted grain market and controls an important shipping trade by rail and water. Its manufactures also are extensive and include agricultural implements, cooperage products, wagons, carriages, starch, glucose, spirits, alcohol, ammonia salts, brick and tile, organs, foundry products, planing-mill products, etc. Settled in 1829, Pekin was incorporated first in 1850. It adopted the commission form of government in 1911, under which power is vested in a mayor and four commissioners elected quadrennially. The street railway is controlled by the municipality. Pop., 1900, 8420; 1910, 9897; 1914 (U. S. est.), 10,524.

PEKING, pè'king' or pà'king' (Chin., Northern Capital). The capital of the Republic of China, situated in the Province of Chili (see PECHILI) (Map: China, L 3). It was the seat of the Imperial government from 1409 to 1912, and is called Peking, or Northern Capital, to distinguish it from Kianningfu, south, of the Yang-tse, which had been the seat of the capital from 1368 to 1409, and is now known as Nanking (q.v.).

Peking is a walled and moated city, with an area of about 25 square miles, and is situated in a sloping sandy plain about 12 miles west of the Pei-ho (q.v.), 70 miles southeast of the Great Wall, and 100 miles from the Taku Forts, where the Pei-ho enters the Gulf of Pechili. The Imperial Observatory stands in lat 39° 54' 31" N. and in long. 116° 28' 24" E. of Greenwich. The elevation above the sea is about 120 feet. The city is surrounded on three sides by mountains distant from 10 to 30 miles, the mountains in the west providing cool breathing spots for the foreign residents in summer as well as an abundant supply of coal for all seasons.

Peking is in the main healthful. The climate is that of north China generally, intensely cold in winter (zero and below), the city, however, being sheltered somewhat by the high walls, while the heat in summer is great, cooling winds being barred out by the height of the walls. The city is connected by railway with Tientsin, Shanhai-kwan, and Mukden and thus has rail connection with Europe by means of the Great Siberian Railway.

General Description. Peking consists of two parts of different shapes, sizes, and dates: the Tatar, or Inner, city, which lies to the north; and the Chinese, or Outer, city, which adjoins the other on the south, the south wall of the Tatar city forming the main part of the north wall of the Chinese city. The former, which is nearly square, has a circuit of about 12.3 English miles, and the latter, which has its greatest extension from west to east, is an imperfect parallelogram measuring 5 miles by 2. The walls of both cities are of earth and concrete, faced within and without with brick. Those of the Tatar city are 40 feet high, 62 feet thick at the base, and 34 at the top, access from within to the top being by stone-paved ramparts. The walls are strengthened at intervals of 60 yards by huge buttresses which project outward 50 feet, and the parapets of both walls and buttresses are loopholed and crenelated. The Chinese city walls are only 30 feet high and 25 feet thick at the base. These walls are pierced by 16 gates, nine of which are in the Tatar city (three in the south wall, communicating with the Chinese city, and two in each of the other three sides). Of the seven gates in the Chinese city, three are in the south wall, one in the east wall, one in the west, and two in those portions of the north wall which project east and west for a quarter of a mile beyond the common wall of the Tatar and Chinese cities and open towards the north. Each gate is protected by a demilune or enceinte and is surmounted by a lofty three-storied tower, 99 Chinese feet (about 119 English feet) in height and covered with green glazed tiles. The Ch'ien mén, or Front Gate, in the centre of the south wall of the Tatar city, like the Yungting Gate of the south wall of the Chinese city, has three entrances, of which the one in the centre was formerly reserved for the Emperor. All gates are closed at sunset.

The Chinese city, built in 1543, is newer than the Tatar city, which was built by Kublai Khan in 1267-71. It contains many vacant spaces, but the bulk of the population is here. Entering by the Yungting Gate in the south wall, a roadway 2 miles in length leads due north to the Ch'ien-mén, or Front Gate, the main entrance to the Tatar city. On the right or east side of this roadway stands the inclosure (1 square mile in extent) containing the Altar of Heaven, surrounded with temples and shrines, including the circular triple-roofed Temple of Heaven, about 119 English feet high. It was burned down in 1889, but has been rebuilt, Oregon pine being used for the pillars. It is roofed with blue porcelain tiles. Here, at midnight of the winter solstice, the Emperor, after due fasting and prayer, was wont to worship Shang-ti, the Supreme Ruler, with prayer, hymns, prostrations, and burnt offerings of oxen, sheep, hares, etc., and of silk, jade, and other precious things. On the west side of the roadway stands the Temple of Agriculture, dedicated to Shin-nung (q.v.), the Divine Hus-

bandman. In this spot every year at the "opening of spring" the Emperor plowed a furrow or two and thus inaugurated for the year the principal industry of his people. In the Chinese city most of the mercantile business of the city is carried on. It also has a powder factory, a former Imperial pottery, a mosque, and many theatres. Here also is the fashionable promenade known as Booksellers Street, where curios of all sorts, precious stones, etc., can be bought. Northward about halfway towards the entrance to the Tatar city is a magnificent marble bridge, an essential, according to the requirements of Fung-shui. Within the Tatar city the first important cross street to the right is Legation Street, a macadamized thoroughfare, extending southeastwardly. Here are the foreign legations, the headquarters of the Chinese maritime customs, the hotel, the two foreign banks, etc.; and here the fury of the bloody Boxer outbreak concentrated as far as the city of Peking was concerned.

Immediately north of the Great Gate is a paved square bordered by a stone palisade. The Mongol market is found here. North of this square is the outer gate leading to the part of the city formerly the Hwangch'ing, or Imperial City, walled and towered like the Tatar city itself. From this a wide avenue leads for a quarter of a mile to the inner gate, within which right and left are seen the temples of ancestors and of grain. A mile and a half farther brings us to the entrance of the Tsze-kinch'ing, or Purple Forbidden City, a great walled inclosure with towers on the corners and over the gates, 1 square mile in extent, containing the Imperial Palace and its pleasure grounds and gardens as well as the numerous reception halls, pavilions, and offices formerly required by the Emperor and his high officers of state in conducting the affairs of the Empire, all roofed with yellow porcelain tiles. North of all this is the beautiful, finely wooded artificial hill called King-shan, or Prospect Hill, 170 feet high, with five peaks, each having a Buddhist temple on top, the whole surrounded with a park a mile in circuit. Continuing northward, the traveler passes through the "back gate" into the former Imperial City. Northward still is the gate leading from the Imperial into the Tatar city.

It is seen that the Tatar city is really a nest of cities, with the former Forbidden City in the centre, the Forbidden City being surrounded by the former Hwang, or Imperial City (6 miles in circuit), containing government offices, temples, pleasure grounds, a beautiful artificial lake on the west side, the White Ming Pagoda built on the spot where the last Emperor of the Ming dynasty hanged himself (1643), the Pei-t'ang, or Roman Catholic cathedral, and many elegant residences of princes and of officers of the government. The Tatar city thus surrounds both the old Forbidden and Imperial cities. It was originally intended for Manchus alone. It contains the public offices of the former Imperial régime, consisting of the eight boards or government departments, including the Foreign Office, or Tsung-li Yamen, now called the Waichiaopu, the Imperial Censorate, the site of the Han-lin (q.v.), adjoining the British Legation on the north and burned down with its unreplaceable libraries during the Boxer disturbances; the Imperial University; the Examination Hall, with its 10,000 cells where were held the triennial competitive literary examinations of the

old Chinese classical system. Other places of interest are the Imperial Observatory; the Christian mission houses, churches, and schools in different parts of the city; Confucian, Buddhist, Taoist, and Lamaistic temples; a great drum tower, etc. There is in addition the temple erected in 1578 to house the great bronze bell, 17 feet high, 12 feet, 8 inches in diameter, weighing 87,000 pounds, cast in the early years of the fifteenth century, and covered within and without with quotations from the Buddhist scriptures. There is also another Roman Catholic cathedral. It is situated in the southwest part of the city. The Ketteler Memorial Arch was dedicated in January, 1903.

The principal streets of Peking are lined with shops, gorgeously painted, and decorated with great pendent signs with gilt characters. At times the streets are very noisy and full of activity. Besides the hurrying to and fro of mandarins and their followers, government messengers, envoys from the provinces, Mongols with their big Bactrian camels, yellow-robed Tibetan and Mongol lamas, itinerant venders of amusement or of infallible medicines or of things to eat or wear, make up a scene of great interest. The principal conveyances are the sedan chair and the springless covered carts, politely called "carriages." The smaller streets are filthy and vile-smelling, but since the post-Boxer military occupation many improvements have been inaugurated by the reforming and progressive prince in whose charge the streets have been placed. The sewers have been thoroughly cleaned out, and the practice of sprinkling the dusty roads with the foul liquid from the gutters has been suppressed. Macadamizing is everywhere in progress. There has been a mint in Peking since 1896, and electrical works since 1900.

The government of the capital of China is very similar to that of Washington, D. C., consisting of an officer and assistants who are responsible to the central authority and not to the Governor of Chili Province. This government district in which Peking is situated is known as Shuntien, and the city of Peking is also known as Shuntienfu.

The population of Peking has been estimated at from 1,400,000 to 2,000,000, but this is probably excessive. A census undertaken by the Minister of the Interior in 1912 estimated the population at 692,500.

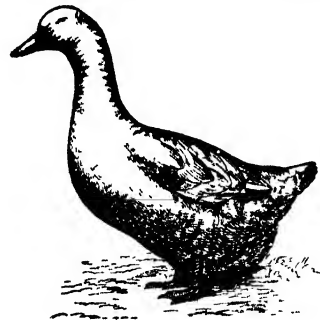
Environs. Without the city are many points of great interest. On the east side is the Temple of the Sun, and on the west the Temple of the Moon, where the Emperor invariably worshiped at the summer solstice. On the north, outside the Anting Gate, is the Altar of Earth, where the Emperor formerly worshiped at the vernal equinox. To the northwest are the tombs of the Ming emperors (except two, who were buried at Nanking), approached through a long avenue of colossal lions, unicorns, camels, elephants, and horses, in marble, two pairs of each. Nine miles northwest is the celebrated Yuen-Ming Yuen, or Summer Palace.

History. From the earliest times there has been a city on or near this spot. In 937 the Khitan Tatars, who had conquered north China, made it one of their capitals and called it Nanking, or Southern Capital, the northern being in Tatar. In 1151 the Kin Tatars called it Chung-tu, or Middle Capital. In 1215 the city was captured by Genghis Khan, and in 1264 Kublai Khan made his capital here and built

the present Tatar city, called Ta-tu, or Great Capital, in Chinese, and called Khan-baligh, or City of the Khan, in Mongol, the Kambalu of Marco Polo. The third Emperor of the Ming dynasty settled here in 1409, caused 1½ miles of its length to be cut off, and built the present north wall. The ruins of this discarded section can still be traced. The Manchus in 1643 accepted the city as they found it, but have improved it much. In 1860 it was spared by the Anglo-French expedition, who had no quarrel with the people, although Lord Elgin ordered the Summer Palace to be burned, as an object lesson to the Chinese government. By agreement, however, they held the Anting Gate during the negotiations. On Aug. 14, 1900, its walls were breached and entered by the allied forces sent to relieve the foreigners besieged in the British Legation, and the city was held by the troops until September, 1901. In 1884 Peking was brought into telegraphic communication with the rest of the world. In 1897 it was connected by rail with Tientsin, the terminus remaining outside the south gate until the military occupation made it necessary to carry it into the city. The station is now opposite the Altar of Heaven.

Bibliography. Edkins, in A. Williamson, *Journeys in North China, Manchuria, and Mongolia* (2 vols., London, 1870); Sir Henry Yule, *The Book of Ser Marco Polo* (2 vols., ib., 1871); Emil Bretschneider, *Archæological Researches in Peking and its Environs* (Shanghai, 1876); W. A. P. Martin, *The Siege in Peking* (New York, 1900); Alphonse Favier, *The Heart of Peking: Diary of the Siege* (Eng. trans., Boston, 1901); Roland Allen, *The Siege of the Peking Legations* (London, 1901); L. M. J. Viaud (Pierre Loti, pseud.), *The Last Days of Peking* (Boston, 1902); A. B. Little, *Round about my Peking Garden* (Philadelphia, 1906); Mary Hooker, *Behind the Scenes in Peking, Being Experiences during the Siege of the Legations* (New York, 1911); B. L. Simpson (Putnam-Weale), *Indiscreet Letters from Peking* (ib., 1911); Bland and Backhouse, *Annals and Memoirs of the Court of Peking* (Boston, 1914).

PEKING DUCK. A domestic duck introduced from China about 1870, which has become widely extended and popular, both for the table and as a producer of excellent eggs. In color it is white or cream white, with deep yellow bill,



WHITE PEKING DUCK.

lead-blue eyes, and orange feet. The body is long and deep, the size large, some birds weighing as much as 20 pounds to the pair, and the breed is hardy, easily raised, and profitable. See Duck.

PÉLADAN, pa'lá'dán', JOSEPHIN, called **LE SAR** (1859-). A French mystic, novelist, and art critic, born in Lyons. He became known as a disciple of Barbey d'Aurevilly, posed as a descendant of the last kings of Babylonia, assuming the title Sar (chief) and a theatrical costume, and attracted increasing attention by a series of novels under the general title of *La décadence latine*, which include *Le vice suprême* (1886), *Curieuse* (1886), *L'Initiation sentimentale* (1887), *A cœur perdu* (1888), *Istar* (1888), *La victoire du mari* (1889), *Cœur en peine* (1890), *L'Androgyne* (1890), and *Le gynandre* (1891). These works are an extraordinary mixture of originality and merely riotous imagination, in which human passions, astrological dreams, esoteric doctrines, and astral adventures vie with one another for precedence and the subtlest sensuality does not come off a loser. Entirely distinct from this cycle is the novel *Femmes honnêtes* (1885). Later works are *La vertu suprême* (1901); *Pereat* (1902); *Périgrine et Pérégrin* (1904); *Origine et esthétique de la tragédie* (1903); *Sémiramis* (1904), a tragedy; *La rondache* (1906); *Le nimbe noir* (1907); *La science de l'amour* (1911); *La thériaque* (1912); *Les amants de Pise* (1912); *St. François d'Assises* (1913). As art critic he published *Rembrandt* (1881); *Une introduction à l'histoire des peintres de toutes les écoles* (1884); *La décadence esthétique* (1888); *Le théâtre complet de Wagner* (1894); *Les idées et les formes* (1907); *Les idées et les formes dans l'antiquité orientale* (1908); *Les manuscrits de Léonard de Vinci* (1910); *L'Art idéaliste et mystique* (1911); *Frans Hals* (1912). He founded the order of La Rose Croix, Croix du Temple, in 1892. In spite of many absurdities it seems to have been a reaction against much that was purely material in French art, a reaction that had its equivalent in the Pre-Raphaelite movement in England several years earlier. The Rosierucians held Salons, called the "Æsthetic Geste," and gave concerts, lectures, and plays written by the Sar Péladan.

PELAGIANISM. A fifth-century Western heresy, which originated with the monk Pelagius (q.v.). He took his starting point from the idea that guilt belongs only to the free action of the will, therefore man is not guilty of Adam's sin (see **ORIGINAL SIN**), nor is his will corrupted. Man chooses by his own power, but God's grace comes in to assist those who choose the right. Augustine, on the contrary, held that man's will was wholly corrupted, and we could choose the right only by the power of the grace of God.

Pelagius spent some time in Rome in high repute before raising the issue which was so deeply to agitate the Western church. About the year 405 he openly objected to a prayer contained in Augustine's *Confessions*, "Give what thou commandest and command what thou wilt," on the ground that it tended to destroy all sense of responsibility. He was soon joined by an able ally, Cœlestius, who had been trained as an advocate, and whose subsequent history is bound up with the Pelagian cause. Fleeing before the Gothic invasion (410), the two friends made their way to Africa, where Augustine was then engaged in his controversy with the Donatists (q.v.). Here Pelagius taught that infant baptism was administered not to remove the stain of sin, because infants had none, but rather to sanctify and admit them to the kingdom of

heaven. This was not Augustine's view at all, and as soon as the Donatist dispute permitted he turned to deal with the new foe. By that time, however, Pelagius had left Africa for Palestine, but Cœlestius remained and was seeking ordination as a presbyter. Objection was raised by one Paulinus, a deacon from Milan, who charged Cœlestius with error. He was examined before a synod (412) and condemned for teaching that Adam would have died even if he had not sinned; that Adam's transgression injured only himself; that infants are born into the state in which Adam was before the fall; that unbaptized infants, dying in infancy, have eternal life; that men may attain heaven through a righteous life (keeping the law) as well as through the gospel; that some men have lived without sin, and others may; and that men can easily live without sin if they will. In opposition to these views Augustine maintained that Adam's sin affected the race, involving all mankind in guilt; that physical death is the penalty of sin; that infants are baptized for the remission of original (inherited) sin; and that the only sinless man in the world was Jesus Christ. Most of these ideas are found in his earliest anti-Pelagian work, *The Deserts of Sins and their Remission* (written in 412).

The arrival of Pelagius in Palestine opened the first chapter in the Eastern history of the controversy. Not a few Origenists sympathized with his views, which were in accord with tendencies in earlier Greek thought, and none of them openly opposed him. But Jerome (q.v.), and a little later the Spanish presbyter Orosius, promptly opened the attack. A synod was summoned by John, Bishop of Jerusalem, to consider the question (415), and to it Orosius reported the action of the African clergy in the case of Cœlestius. During the examination of Pelagius his Latin and the synod's Greek seem to have occasioned some misunderstanding, but he finally consented to anathematize any one who taught "that man can ever become perfect without God's aid," and this so far satisfied the synod that it dissolved without condemning him. Orosius, however, and some others, felt that the Bishop had not been impartial in his conduct of the inquiry. At the more important Synod of Diospolis, presided over by Eulogius of Cæsarea (415), Pelagius either disavowed or explained away the heretical opinions with which he was charged and was thereupon pronounced orthodox—a result which angered Jerome and caused Augustine afterward to declare that Pelagius had deceived his judges. Pelagius now proceeded to issue his treatise *On Free Will*, which was presently supported by Theodore of Mopsuestia, who attacked Jerome's idea that "men sin by nature, not by will."

Upon Orosius' return to Carthage a synod was held (416), reaffirming the adverse judgment of the African church and appealing to Innocent, Bishop of Rome, to aid in opposing Pelagianism with "the authority of the apostolic see." A similar appeal was made by the Synod of Mileve in Numidia. Innocent replied as they had hoped he would, saying that Pelagians must be excluded from the Church. Two months later he was succeeded by Zosimus, a Greek, who proved more friendly to the Pelagians than his predecessor. To him Cœlestius appealed in person, and after examination, in which he denied the heretical opinions charged against him and made a formal profession of faith, the Pope re-

fused to condemn him, although he cautioned him to abstain from pursuing further his unprofitable speculations. Soon after this Zosimus received from Pelagius a written statement of belief, similar to that of Cœlestius, on the strength of which he too escaped condemnation. The African clergy were greatly disturbed at the Pope's action, reversing as it did the policy of Innocent, but they were not to be turned from their position. Another large synod reaffirmed once more the condemnation of Pelagianism and urged upon Zosimus a reconsideration of the whole case. Their action, coupled with the fact that at this juncture the Emperor Honorius issued a strong anti-Pelagian decree, aroused the Pope to action. He reversed his judgment and now wrote a circular letter to the bishops, calling upon them to assent to the condemnation of Pelagius and Cœlestius and setting forth in Augustinian terms the doctrine of sin and grace. This document is known as the *Epistola Tractoria*, and its date is 418. What may be regarded as the final collective action in the West was taken by a great national synod held the same year in Carthage, whose decrees anathematize Pelagianism in clear and unmistakable terms. Soon afterward Augustine wrote his two works, *On the Grace of Christ* and *On Original Sin*, in which he argues that all man's righteousness comes from God, who is the ultimate principle of goodness, back of every impulse of the human heart. Here one may find the uncompromising doctrine of the necessity of divine grace which is characteristic of Augustinianism. And here, too, is that last resort to which Augustine more than once was driven by the logic of his opponents, the inscrutability of God's dealings with His creatures, expressed in the words of St. Paul, "O the depth of the riches, both of the wisdom and the knowledge of God!" (Rom. xi. 33). Augustine had indeed reached the boundaries of knowledge.

But Augustinianism was not yet victorious. Eighteen Italian bishops refused their assent to the *Tractoria* of Zosimus, among them Julian of Eclanum, one of the best debaters on the Pelagian side. These bishops were promptly excommunicated, but Julian headed a schism which lasted for several years and gave the Church no little trouble. The Pelagians took refuge in the East, where, among others, the patriarch Nestorius showed them favor. But their partial alliance with him proved disastrous in the end, for at the Third Ecumenical Council (Ephesus, 431) both Nestorius and Pelagius were condemned. This result was largely due to the untiring efforts of Marius Mercator, a layman from the West, to whom we owe much of our information on the subject. Pelagian views did not at once disappear, either in the East or in the West, even penetrating to Britain and Ireland; for their subsequent history, see SEMI-PELAGIANISM.

Bibliography. Besides the works referred to under PELAGIUS consult: J. Müller, *The Christian Doctrine of Sin* (Edinburgh, 1868); K. J. von Hefele, *History of the Councils*, vol. ii (Eng. trans., ib., 1876); F. Wörter, *Der Pelagianismus* (Freiburg, 1882); B. B. Warfield, *Two Studies in the History of Doctrine* (New York, 1897); Adolf Harnack, *History of Dogma*, vol. v (trans. from 3d Ger. ed. by Neil Buchanan, Boston, 1898); Robert Rainy, *The Ancient Catholic Church* (New York, 1902); Augustine's *Anti-Pelagian Works* (Eng. trans. in *The Nicene*

Fathers, 1st series, vol. v, ed. by Philip Schaff, ib., 1908); also Wace and Piercy (eds.), *Dictionary of Christian Biography and Literature* (Boston, 1911).

PELAGIC (pê-lāj'ik) **ANIMALS** (from Gk. πελαγικός, *pelagikos*, relating to the open sea, from πέλαγος, *pelagos*, open sea). The pelagic or surface fauna of the ocean comprises an assemblage of animals which live on the high seas, far from land. They live permanently at or near the surface of the ocean, in the warmer parts of the earth. Among them are many Foraminifera, of which *Globigerina* is the most abundant, also the Radiolaria (q.v.), Siphonophora (q.v.), many Medusæ (see MEDUSA), all the Ctenophora, many entomostracous Crustacea, certain schizopod Crustacea, as *Mysis*, pteropod and heteropod mollusks, the nudibranch *Glausus*, the Salpæ (see SALPA), and most cephalopods, as the squid and calamary; while the flying fish, certain little fishes (Antennariidæ) nesting in gulf weed, many sharks, and the whales and porpoises make up the assemblage.

The pelagic invertebrate animals, such as the Medusæ, Salpæ, etc., are very transparent, either colorless or with blue or violet tints. The pelagic fishes are usually gray or steel blue above, white beneath, not being so strikingly marked as those frequenting the shore or coral reefs. See DEEP-SEA EXPLORATION; LANTERN FISH; OOZE; PLANKTON.

PELAGIC SEALING. See ALASKA, *Furs*.

PELAGIUS, pê-lă'jī-ŭs. A British monk, author of the Pelagian heresy, who flourished during the first quarter of the fifth century. The dates of his birth and death are unknown; his life from about 400 to 418 is better known. A late and uncertain tradition says that his name was Morgan (*Marigena*, sea-born), of which Pelagius (Πελάγιος) would be the Greek translation. Augustine calls him a "holy man, who has made no small progress in the Christian life." The known history of his life begins with his visit to Rome, whither he went probably in the year 401; thenceforth it is that of the Pelagian controversy, for which see PELAGIANISM. He left Rome in 411 and went to north Africa and thence to Palestine. Nothing is known with certainty of the close of Pelagius' life, but one tradition says that he died in Palestine at the age of about 70 years. Among his writings we have the creed which he submitted to Bishop Zosimus, a letter to Demetrius about the ascetic life, and some fragments. He wrote a work *On the Trinity*, another *On Free Will*, a *Commentary on Paul's Epistles*, probably extant in a revised form among the works of Jerome, and the *Eulogia*, a collection of extracts from the Scriptures, for use as an aid to Christian living. Consult: G. P. Fisher, *History of Christian Doctrine* (New York, 1896); W. Bright, *The Age of the Fathers*, vol. ii (London, 1903); Augustine, *Anti-Pelagian Works* (Eng. trans. in *The Nicene Fathers*, 1st series, vol. v, ed. by Philip Schaff, New York, 1908); Wace and Piercy (eds.), *Dictionary of Christian Biography and Literature* (Boston, 1911); and the literature under PELAGIANISM.

PELAGIUS. The name of two popes.—PELAGIUS I (Pope, 555-60). He came of a noble Roman family and as a deacon accompanied Pope Agapetus I to Constantinople (536). Pope Vigilius appointed him his representative at the Imperial court there in 540, and he won great

influence over the Emperor Justinian. He took a vigorous part in the controversy over the Three Chapters of Justinian (see CHAPTERS, THE THREE), in which the decree of the Council of Chalcedon on the Person of Christ was constructively condemned. Despite his opposition to the Emperor's views, the latter, on the death of Vigilius, put him forward as his candidate for the vacant see. He was ill received on his return to Italy as the Imperial nominee, and only two bishops came to assist in his consecration. He endeavored to clear himself from the charge of complicity in heresy by a solemn protestation of allegiance to the teaching of the four general councils, and especially that of Chalcedon; but he could not prevent a schism in northern Italy. He died in Rome, March 3, 560, or, according to Duchesne, March 4, 561. His letters are in Migne, *Patrologia Latina*, lxi; some additional ones in Lowenfeld, *Epistolar Pontificum Romanorum Ineditæ* (Leipzig, 1885). —PELAGIUS II (Pope, 578–90), born in Rome of a Catholic family. He was elected Pope when Rome was besieged by the Lombards, and appealed to the Greek Emperor Tiberius II for assistance, but that monarch was too much occupied with a war in Persia. He then turned to the Franks, with whom Maurice, the successor of Tiberius, concluded a treaty. The Franks, however, proved untrustworthy allies, and the troubles of Italy continued. He took great offense at the toleration of the title "universal bishop" by John the Faster, Patriarch of Constantinople, and forbade his representative there to attend any service celebrated by John. But his heart was gladdened at the end of his pontificate by the news that the West Goths in Spain had returned from Arianism to the orthodox faith (589). He died of the plague in Rome, Feb. 7, 590. His letters are in Migne, *Patrologia Latina*, lxxii. He was succeeded by Gregory the Great, who had long been his trusted counselor and in whose biographies many of the events of his pontificate will be found; consult also Weise, *Italien und die Langobardenherrscher* (Halle, 1887), and Mann, *Lives of the Popes*, vol. i (London, 1902).

PELAGOSAURUS (Neo-Lat., from Gk. *πέλαγος*, *pelagos*, open sea + *σαῦρος*, *sauros*, lizard). An extinct Liassic crocodile, found fossil in southern Germany, in France, and in England, having a peculiarly elongated narrow skull and jaws furnished with many sharp, slender teeth. See CROCODILE.

PELARGONIC ACID, $C_6H_{10}O_2$. One of the so-called fatty acids. It is an oily liquid, nearly insoluble in water, but soluble in alcohol and ether. It derives its name from its having been originally obtained from the leaves of *Pelargonium roseum* by distilling them with water. It may also be obtained by the oxidation of oil of rue with nitric acid. It is supposed to exist in a combined form in old whisky.

PELARGONIUM (Neo-Lat., from Gk. *πελαργός*, *pelargos*, stock; so called from the resemblance of the capsules to a stork's bill). A genus of plants of the family Geraniaceæ, including many favorite greenhouse and house plants, which are generally called geraniums (q.v.). The genus contains about 200 species, smooth or downy perennial herbs or undershrubs, native chiefly of South Africa, a few species being found in the Mediterranean region and in Australia. The species in cultivation have become so modified that it is often difficult

to determine their origin. The leaves exhibit great variety in form, texture, fragrance, and color. The flowers always adhere to a certain type in form, but vary greatly in color and size; they are always in stalked umbels, arising from



A CULTIVATED VARIETY OF PELARGONIUM.

the axils of the leaves, or in the stemless kinds from the midst of the leaves. In no genus has the art of the gardener produced more striking results than in this; and the number of beautiful hybrids and varieties is very great, some of them excelling in beauty any of the original species. Some species, not possessing much beauty of flower, are cultivated for the grateful odor of their leaves. Geranium oil, used as a substitute for attar of roses, is distilled from *Pelargonium odoratissimum* in Algeria and from *Pelargonium roseum* and other species in Cape of Good Hope. The cultivated species are divided into four groups, viz., ivy geraniums, derived from *Pelargonium peltatum*; scarlet, horseshoe, or zonal geraniums, from *Pelargonium zonale* and *P. inquinans*; Lady Washington geraniums; and rose geraniums. The horseshoe geraniums often have a horseshoe-shaped dark zone on the leaf. The flowers of the Lady Washington varieties are very large and irregular, while the rose-colored or purple flowers of the rose geraniums are rather small. These last two groups each include a number of different species. Most of the common varieties are largely grown as bed and border plants, their outdoor culture being quite simple. For this purpose the plants are taken from the greenhouse after danger of frost has passed and set out in a well-worked, rich, sandy loam. Water must be liberally supplied during the time of flowering; but for no plants is a period of rest more necessary, and water must then be very sparingly given. Many of the half-shrubby kinds may be trimmed of leaves and watery shoots, hung up by the roots in a dry cellar, or covered with hay in a box, in a cool but frost-proof dry loft or garret. Another method is to cut off every leaf before frost comes and to keep the plants all winter in their pots in a dry, cool room, without watering them. By such means many varieties are successfully cultivated by persons who have no greenhouse. Pelargoniums are commonly propagated by cuttings from the firm shoots, which root readily.

PELASGIAN (pē-lās'jī-an) **ARCHITECTURE**. See CYCLOPEAN ARCHITECTURE; PELASGIANS.

PELASGIANS (Lat. *Pelasgi*, from Gk. *Πελαγιοί*, *Pelagioi*, of uncertain etymology). The name of a people dwelling in Greece in early

times, used with very different meanings at different periods. In the Homeric poems the Pelasgians seem to be the inhabitants of Pelasgian Argos in southern Thessaly, about Mount Othrys, and of the fertile valley of the Peneus around Larissa in Thessaly, and the Zeus of Dodona is also called Pelasgian. In a somewhat late part of the *Iliad* they appear among the allies of the Trojans, thereby causing much trouble to ancient and modern commentators. As there is no other trace of their existence in Asia Minor, very possibly the poet, knowing of enmity between the Achæans of Phthiotis and their northern neighbors, thought of the latter as coming from Thessaly to Troy. In the *Odyssey*, xvii, 175-177, they are mentioned as one of the tribes in Crete. Nothing in the epic indicates that they are of other race than the Greeks. Like the other tribes of Thessaly they seem to have been conquered by the Thessalians, and probably largely reduced to the position of *penestæ*, or serfs, though their old territory was known in historical times as Pelasgiotis. Tradition, however, told of the former state of their King, Pelasgus, son of the earth. This seems the slender basis on which the extensive and contradictory legend of the Pelasgians grew up. In Hesiod we find Pelasgus transferred to Arcadia, whose people also claimed to be autochthones, though it must be said that Pelasgians do not appear as a race in any early Arcadian legend. The epithet Pelasgian was transferred to Argos in Peloponnesus, and we find there also a King Pelasgus prepared to receive Danaus and his daughters. Herodotus decided that the old name of Greece was Pelasgia, and that the Pelasgians preceded the Hellenes (naturally, since Hellenes could not well exist before Hellen and his three sons), while many Greek genealogies traced descent from different sources. Further confusion was invited by the transformation of the Athenian name for the old fortification of the Acropolis, Pelargicon, into Pelasgicon; whence it followed that Pelasgians had lived in Attica. Moreover, Hecateus, who seems to have made this transformation, also identified the Tyrrhenians of Lemnos with Pelasgians and brought them from Attica to the island. As the Etruscans were also Tyrrhenians, it followed that they were Pelasgians, and so the race appeared in Italy. This identification also converted Pelasgians into barbarians, for every one knew that the Tyrrhenians were not Greek. Thus towards the end of the fifth century B.C., apparently by Hecateus, the legend was fully developed that they were the original inhabitants of Greece, driven from Peloponnesus to Thessaly by the Danaans and scattered to the four winds by the Hellenes. It has been well said that in general the Pelasgians only appear in a land in order to be driven out. From this conception of the Pelasgians naturally arose the theory that to them were due the great works of the early days, and the mighty walls that some called Cyclopean were by others termed Pelasgian. In recent years it has become very common to employ the term Pelasgian to designate the pre-Aryan population of Greece and Italy, to whom is attributed the pre-Mycenæan civilization; not, of course, with the implication that this population formed one great people, but rather as a convenient collective name for more or less closely related tribes. This use may be criticized as easily leading to the belief that it rests

on ancient authority and not on modern speculation. Of late the Pelasgians have been brought into special prominence by the theory that to them is due the entire Mycenæan civilization; that they were invaded and conquered by the Achæans, a fair-haired tribe akin to the Celts, who became a ruling class and to whom is due the Homeric civilization. The dark-haired Pelasgians, it is held, gradually absorbed their conquerors, as has been the case in other invasions of these lands by blond northern races. The theory uses largely, if uncritically, the ancient authorities, but has not won general acceptance.

The literature on this question is very voluminous. The more important discussions, to 1889, are collected in Hermann, *Lehrbuch der griechischen Antiquitäten* (6th ed. by Thumser, Freiburg, 1889). Consult also Busolt, *Griechische Geschichte*, vol. i (2d ed., Gotha, 1893). For the ancient statements, consult S. Bruck, *Quæ Vetres de Pelasgis Tradiderint* (Breslau, 1884), and especially the thorough examination by E. Meyer in his *Forschungen zur alten Geschichte*, vol. i (Halle, 1892), who has shown how largely they consist of guesses. The new theory is presented in W. Ridgeway, *Early Age of Greece* (Cambridge, 1901 et seq.). It is discussed in H. R. Hall, *Oldest Civilization of Greece* (Philadelphia, 1901), and by J. L. Myers in *Classical Review*, vol. xvi, in a review of Ridgeway's book (London, 1902). Consult also J. L. Myers, "A History of the Pelasgian Theory," in *Journal of Hellenic Studies*, vol. xvii (ib., 1907), and R. Pöhlmann, *Grundriss der griechischen Geschichte* (4th ed., Munich, 1914). See MEDITERRANEAN RACE.

PELAYO, pá-lá'yô (died 737). The first Christian King in Asturias after the conquest of Spain by the Arabs. Little is known about his life. He was, strictly speaking, nothing but a robber chieftain; still by his defense of Covadonga, a mountain fastness, in 718 against the Moslems, he kindled the national spirit and laid the foundation for the Christian recovery of Spain. A legend states that at Covadonga he and 30 followers destroyed an Arab army 400,000 strong. Consult U. R. Burke, *A History of Spain*, vol. i (London, 1895).

PELECYPODA (Neo-Lat. nom. pl., from *πέλεκυς*, *pelekys*, axe + *πούς*, *pous*, foot), or **LAMELLIBRANCHIATA**, or **BIVALVES**. A class of bilaterally symmetrical acephalous mollusks, all of which have bivalve shells and gills in the form of vascular plates of membrane attached to the inner surface of the mantle. The body is very strongly compressed, the dorsoventral diameter being much greater than the lateral. The adductor muscle, which closes the shell, is single in some, double in the greater number. The shell is naturally more or less open, owing to the peculiar elastic hinge which tends to keep it open; but the adductor muscles continually tend to close it. Consequently when a live mollusk is irritated the shell closes tight, but when the animal is dead the muscles relax and the shell gapes open. Important differences exist in the powers of locomotion. Oysters are fixed to one spot by one of the valves of the shell; but most of the pelecypods have the power of moving by swimming, leaping, or burrowing in sand, sometimes in more than one of these ways, being provided for this purpose with a fleshy muscular organ called the foot. Some, as mussels, fix themselves when young by a cable of chitinous threads, the byssus. The mouth is

jawless and toothless, but on each side are two flaps, the labial palpi. All seem to depend for their food on the currents of water continually brought by ciliary action into the mouth. The edges of the mantles are sometimes entirely separate from each other, but are often more or less fused. In the latter case two openings are left in the posterior edge, through the lower of which water is brought into the mantle cavity, whence, having been deprived of its oxygen by flowing over the gills, and of its nutritive material in the stomach, it passes out through the upper opening, carrying away the waste and, at the proper season, the reproductive elements. Various modifications of this inhalant and exhalant apparatus exist, and in many forms the orifices become elongated into two tubes called siphons, which, as in the clam, may often be extended several inches beyond the shell. Bivalves with such siphons live buried in mud or sand with only their siphons reaching the surface. The edges of the mantle often bear tentacles, papillæ, glands, and more or less complicated eyes. The two halves of the shell are usually of about the same size, but in some forms one valve is very much larger than the other. Generally the shell covers the whole animal, and when the shell is closed the animal is completely shut in, but in the shipworm (q.v.) the two halves of the shell are very small and inclose only an insignificant part of the greatly elongated body.

The ear, or otocyst, is situated in the foot. The heart is three-chambered, there being two auricles and one ventricle. The sexes exist in different individuals. The number of eggs is usually enormous, the oyster producing about 2,000,000 each season. The young pelecypod passes through a free-swimming veliger stage, and some bivalves get their growth in a single year. The freshwater mussels live from 10 to 12 years, while the giant clam (*Tridacna*) is supposed to attain an age of from 60 to 100 years. Many bivalves are of great use to man as food, notably oysters, clams, and scallops. Others, as the shipworm (q.v.), are injurious. The mollusks of this class vary in size from a small fraction of an inch up to the giant clam (q.v.) of the East Indies, which reaches 3 feet in length. In many species the shells are very beautiful, the interior being lined with nacre, or mother-of-pearl. Pearls (see PEARL) are formed in many, especially in the pearl oyster and freshwater mussels. Bivalves inhabit all parts of the world in both salt and fresh water, and form a highly important part of the food of many valuable fishes, especially those of the cod family, as well as of other marine animals. About 14,000 species are known, 8000 or 9000 of which are fossils; and they are generally grouped in five orders, distinguished by the character of the gills.

See MOLLUSCA; MOLLUSK and authorities cited thereunder; OYSTER; Colored Plate of CLAMS AND EDIBLE MUSSELS and Plate of ABALONE, ETC.

PELÉE, MONT, mōn pe-lâ' (or more properly, MONTAGNE PELÉE). A volcano of the island of Martinique, in its northwestern part, in about lat. 14° 48' N. (Map: West Indies, G 4). The elevation of the Morne de la Croix (the culminating point at the time) before the eruption of May, 1902, was about 4300 feet; of the newly formed cone, with its extended plug or obelisk, in May, 1903, 5200 feet. The mountain has ex-

tremely gradual slopes, which rise with gradients of from 5 to 25 degrees, and is constructed of alternating lava masses (andesite) and fragmental agglomerates. Its surface is scarred by deep ravines and waterways, the latter numbering about 25, the majority of the streams taking individual courses to the sea. Prior to 1902 the only recorded eruptions occurred in 1762 and 1851, neither of which was very violent. All of the outbreaks have been from craterlets situated on the western and southwestern slopes of the mountain. The disastrous eruptions of 1902 were from the basin of the Etang Sec, or Dry Lake, the true crater, about ½ mile in greatest diameter, surrounded in greater part by rugged walls of rock 1600 feet or more in height. The seaward face of the Morne de la Croix plunged at an angle of 75° into this crater basin. The active opening of this crater was on April 25, 1902; from it, on May 5, descended an avalanche of boiling black mud that destroyed the sugar estate (*usine*) of Guérin and buried beneath its mass 30 or more of the workmen and proprietors. Then followed the great explosion of May 8, when a black cloud of explosive and exploded superheated steam, charged with glowing incandescent particles, destroyed St. Pierre and with it hardly less than 30,000 people. The phenomena of this remarkable eruption have not been presented in detail, but they were extraordinary for the intensity of the associated electric manifestations, the vast disturbance in the magnetic field, and the violence of the destroying blow. The magnetic disturbance was transmitted to the antipodal region of the earth in about two minutes' time, while the noise of the eruption manifested itself forcibly at Maracaibo, Venezuela, and beyond, at a direct distance of 850 miles, or considerably more.

The second death-dealing eruption of Mont Pelée took place on Aug. 30, 1902, and destroyed in less or greater part Morne Rouge and Ajoupa-Bouillon, besides inflicting considerable damage, with loss of life, upon Morne Balai, Morne Capot, and Bourdon (Basse-Pointe). The loss of life was estimated at from 2000 to 2500. For some time after that date the volcano was continuously active, discharging vast quantities of lapilli and ashes. The column of ejected steam, laden with dust and lava bombs, shot forth from the crater on August 30, just before the second great eruption, was estimated to have a diameter of 1500 feet as it rose over the crest of the crater, and its initial velocity was roughly computed to be in the neighborhood of 100 miles an hour. The steam ascended miles into the air, spreading out into a broad, mushroom-like canopy. The most extraordinary feature associated with the later activity of Pelée was the giant mass of rock, a veritable obelisk, which was slowly pushed out through the summit opening of the new cone and rose to upward of 800 feet, with a basal thickness of 300-350 feet. This afterward disappeared.

Despite the accentuated warnings which for a period of two weeks and more Mont Pelée threw out presaging disaster, only a few hundred of the inhabitants of St. Pierre took the precaution to leave the city; and this loss to the population was counterbalanced by numbers of refugees who from minor villages and hamlets had flocked to the larger city for protection. The annihilating blow came with appalling swiftness, and there is reason to believe that for the greater part of the 30,000 victims death

was well-nigh instantaneous or, at least, brought about in two to three minutes. Only two of the inhabitants from the city proper appear to have survived their wounds, although a dozen or more lingered on in the hospital of Fort-de-France and elsewhere for a few days. The attitudes and conditions of many of the corpses found among the ruins were largely suggestive of the remains (casts) recovered from Pompeii, and there is reason to believe that the destruction of the two cities may have been brought about in very nearly the same way. In both places many of the bodies were found wholly destitute of clothing or giving indication of having had the clothing swept from the body by a tornadic blast. For several days preceding the cataclysm St. Pierre was well covered with ash, lending a wintry aspect to the city. See MARTINIQUE.

Bibliography. Emile Berté, "Les éruptions de la Montagne Pelée," in *Géographie*, vol. xvi (Paris, 1902); Deckert, "Die westindische Vulkankatastrophe und ihre Schauplätze," in *Gesellschaft für Erdkunde Zeitschrift* (Berlin, 1902); Geikie, "The Volcanic Eruptions in the West Indies," in *Pall Mall Magazine*, vol. xxvii (London, 1902); R. T. Hill, "Report on the Volcanic Disturbances in the West Indies," in *National Geographical Magazine*, vol. xiii (Washington, 1902); E. O. Hovey, "Martinique and St. Vincent," in *American Museum of Natural History, Bulletin*, vol. xvi (New York, 1902); Russell, "Phases of the West Indies Eruptions," in *Century Magazine*, vol. lxiv (ib., 1902); A. de Lapparent, "L'Eruption de la Martinique," in *Revue des Questions Scientifiques*, 3d series, vol. iii (Louvain, 1903); Angelo Heilprin, *Mont Pelée and the Tragedy of Martinique* (Philadelphia, 1903); id., *Tower of Pelée* (ib., 1904); id., *Eruption of Pelée* (ib., 1908).

PELEE (pé'lé) ISLAND. An island in the western waters of Lake Erie, belonging to Essex County, Ontario, Canada, about 6 miles northward of the Put-in-Bay group and 10 miles southwest of Point Pelee on the Essex County mainland (Map: Michigan, G 7). It is 9 miles long and 4 miles wide at its widest part. Marshlands cover a part of the area and some timber is found. The land is being rapidly occupied by vineyards, and grapes are becoming a considerable product.

PELETHITES. See CHERETHITES AND PELETHITES.

PELEUS (Lat., from Gk. Πηλεΐς). In Greek legend, a son of Æacus, King of Ægina, and the nymph Endeïs, and a brother of Telamon. In jealousy he and Telamon brought about the death of their half brother Phocus and were banished. He withdrew to Phthia in southern Thessaly, where Eurytus purified him from bloodguiltiness and gave him his daughter Antigone to wife. While participating in the Calydonian Hunt he had the misfortune to kill his father-in-law accidentally. Once more an exile, he withdrew to Iolcos, where Acastus, son of Pelias, was celebrating magnificent funeral games for his father. In these Peleus took part, but was defeated by Atalanta in wrestling. Here he attracted the notice of Astydameia, wife of Acastus (or, in another version, Hippolyte, daughter of Cretheus), who offered him her love. On his refusal she slandered him to his wife and Acastus. Antigone hanged herself, while Acastus planned the death of Peleus.

Rescued by Chiron, the good centaur, Peleus later returned with Jason and the Dioscuri, destroyed the city, and killed Acastus and his wife. Celebrated in legend was his marriage to the Nereid Thetis, who had been sought by Zeus and Poseidon, but was given to a mortal because of the prophecy that her son would be mightier than his father. Peleus, helped by the gods, lay in wait for her by the shore, and in spite of her transformations into fire, water, and wild beasts, held her fast until she returned to her original form. The marriage was attended by all the gods, who bestowed valuable gifts. Poseidon gave him two immortal horses, and Chiron the ashen spear which Achilles wielded at Troy. Into this gathering Æte threw the golden apple inscribed "For the Fairest," which led to the Judgment of Paris and the Trojan War. (See PARIS.) By Thetis Peleus became the father of Achilles (q.v.), and in later writers she is said to have returned shortly to her life as a Nereid, while the boy was brought up by Chiron; but this tale seems unknown to the Homeric poems, though even in the *Iliad* Thetis is represented as dwelling in the sea. Peleus is also said to have been one of the Argonauts (q.v.) and to have accompanied Hercules and Telamon to Troy. The marriage of Peleus and Thetis was described by later poets (consult, e.g., Catullus, lxiv), and was represented on works of art, of which the best known is the celebrated François vase in Florence, made by the Athenians Clitias and Ergotimos in the sixth century B.C.

PELEW (pé-léw) ISLANDS. A group of islands in the Pacific Ocean. See PALAU ISLANDS.

PELHAM, HENRY. See NEWCASTLE, FIFTH DUKE OF.

PELHAM, pé'l'am, HENRY FRANCIS (1846-1907). An English educator. He was educated at Harrow and at Oxford, where in 1869 he was elected a fellow of Exeter College. At Exeter he was afterward tutor for 21 years. In 1887 he became university reader in ancient history, in 1889 succeeded Canon Rawlinson as Camden professor of that subject, and from 1897 until his death was president of Trinity College (Oxford). His publications include: *Outlines of Roman History* (1890); *The Imperial Domains and the Colonate* (1890); *The Roman Frontier System* (1895); *Essays* (1911).

PELHAM, PETER (1684 or 1694-1751). An English mezzotint engraver, born probably at Chichester. After engraving about 20 portraits, including Queen Anne, after Kneller, and Oliver Cromwell, after Walker, he emigrated in 1726 to America and settled in Boston. Here he opened a school in which he taught painting, reading, writing, dancing, and needlework, also keeping up his engraving. His mezzotint portrait of Cotton Mather (1727) was the first of its kind ever produced in America. He engraved 13 other plates, principally heads of divines, which show considerable merit. Some are after his original paintings. Pelham was the stepfather and first master of John Singleton Copley (q.v.).

PELHAM-HOLLES, hólz, THOMAS, first DUKE OF NEWCASTLE. See NEWCASTLE, THOMAS PELHAM-HOLLES, first DUKE OF.

PELHAM, OR THE ADVENTURES OF A GENTLEMAN. A novel by Bulwer-Lytton (1828).

PELIAS (Lat., from Gk. Πηλεΐας). In Greek legend, a son of Poseidon and of Tyro, daughter

of Salmoneus, and twin brother of Neleus, father of Nestor. With his brother he was exposed by Tyro, but the children were found and reared by a herdsman, who named him Pelias (cf. *πέλος*, *pelos*, dark-colored) because his face was livid from a kick by a mare. In the meantime Tyro had become the wife of Cretheus, King of Iolcos in Thessaly, and mother of Aeson, Pheres, and Amythaon. The twins later found their mother, and after Cretheus's death Pelias succeeded in seizing the throne from Aeson, who fled into exile. By his wife, Anaxibia, daughter of Bias, he became father of Acastus and four daughters. One of these was Alcestis, who was won by Admetus, who met the test imposed by her father by harnessing a lion and a boar to a chariot. Jealous of Jason, his nephew, Pelias dispatched him to secure the Golden Fleece at Colchis. (See ARGONAUTS.) On the return of the *Argo* Medea persuaded the daughters of Pelias that she could rejuvenate their father by boiling his flesh with magic herbs. They accordingly killed and cut up the old man, but were then mocked by Medea, who thus revenged the wrongs of her husband, Jason. Pelias' funeral was celebrated with great splendor by Acastus, and the games were a favorite theme with ancient poets. See MEDEA.

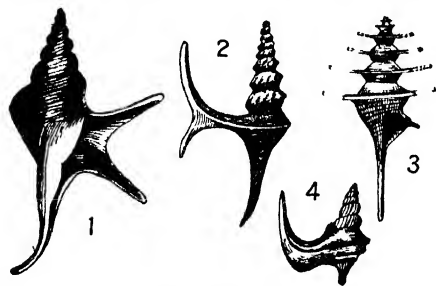
PELICAN (AS. *pellican*, from Lat. *pelicanus*, *pelicanus*, from Gk. *πελεκάν*, *pelekan*, pelican, connected with *πελεκᾶς*, *pelekas*, woodpecker, and *πέλεκυς*, *pelekys*, axe). A large web-footed, fish-eating water bird of the family Pelecanidae and the genus *Pelecanus*, having a very large, long, flattened bill. The upper mandible, which is terminated by a strong hook, curves over the tip of the lower one, and beneath the lower mandible, which is composed of two flexible bony branches meeting at the tip, a large distensible pouch of naked skin is appended. The tongue is very short and almost rudimentary, the face and throat generally are naked, the wings of moderate length, the tail rounded. About 12 species are known, widely distributed in warm regions, frequenting the shores of the sea, lakes, and rivers, and feeding chiefly on fish. They take their prey by plunging upon it into the water, and store it in their pouch for their own eating at leisure or to feed their young. Three species of pelican occur in the United States. The white pelican (*Pelecanus erythrorhynchos*) was formerly found throughout North America, but is now rare east of the Mississippi, except along the Gulf coast, where it winters. It resembles the common pelican of the Old World, but differs in having a curious horny prominence on the bill during the breeding season. The plumage is pure white, excepting the primaries. It is the largest American species, being 5 feet long and 8 or 9 feet across the wings. It breeds in colonies generally. The eggs, from one to four in number, are creamy or bluish white, $3\frac{1}{2}$ inches long by $2\frac{1}{4}$ broad. The brown pelican (*Pelecanus fuscus*, or *occidentalis*) is somewhat smaller than the white pelican and gray and brown. It is found throughout the West Indies, occurs as far north as South Carolina, and breeds throughout its range. The brown pelican of the California coast (*Pelecanus californicus*) is a trifle larger and shows more difference in color.

The common pelican of the Old World (*Pelecanus onocrotalus*) is as large as a swan. Its

plumage is white, tinged with flesh color. It is a native of eastern Europe and of many parts of Asia and Africa and frequents both the sea-coast and rivers and lakes. It makes a nest of grass on the ground near the water and lays two or three white eggs. The parents are said to carry water to their young, as well as food, in their pouches. The nail or hook which terminates the bill is red, and it has been suggested that the ancient fable of the pelican feeding its young with blood from its own breast originated from its habit of pressing the bill upon the breast, when the red tip might be mistaken for blood.

In heraldry the pelican is drawn with her wings indorsed and wounding her breast with her beak. When represented in her nest feeding her young with her blood she is called a pelican in her piety. This is connected with the fable above mentioned and with the symbolism of the pelican in mediæval religious art as significant of self-sacrifice. Consult Louisa Twining, *Symbols and Emblems of Early and Mediæval Christian Art* (new ed., London, 1885) See Plate of FISHING BIRDS

PELICAN ISLAND. See ALCATRAZ
PELICAN'S-FOOT, or SPOUT SHELL A



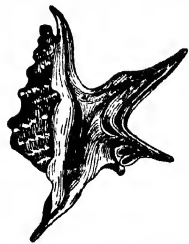
FOSSIL APORRHAIIDÆ.

1, *Alaria myurus* (lower Oolite), 2, *Anchura carinata* 3, *Spinigera semicarinata* (Jurassic), 4, *Aporrhais calcarata* (upper Greensand)

shell of a gastropod of the family Aporrhaidæ, of which but four living species remain, but a great number of quaintly-shaped fossil species are known from the Jura onward. The most common specimens are of *Aporrhais pes-pellicani*, numerous on the western European coast. Its widely distended and prolonged outer lips account for its popular name. A heavier, less forked species (*Aporrhais occidentalis*) is occasionally seen off New England. These mollusks inhabit rather deep water, and their habits are little known.

PELICAN STATE. Louisiana. See STATES, POPULAR NAMES OF.

PELION (Lat., from Gk. Πήλιον) A range on the coast of Thessaly, southeast of Ossa (Map: Greece, E 4). The chief summit, now called Plessidi, is 5308 feet high and in ancient times was a seat of the worship of Zeus Acræas. The mountain is still thickly wooded with oak, chestnut, and beech. In ancient legend it played an important part as the home of the centaurs, and especially of the good centaur Chiron, whose cave was shown in later times. Otus and



PELICAN'S-FOOT SHELL.

Ephialtes (see *ALOAE*) in their attempt to scale heaven were said to have piled Ossa on Olympus and Pelion upon Ossa, or, according to Vergil, Ossa on Pelion, and Olympus upon Ossa.

PÉLISSIER, *pá'lé'syá'*, AIMABLE JEAN JACQUES, DUKE OF MALAKOFF (1794-1864). A marshal of France, born at Maromme, near Rouen. He studied at the artillery school of La Flèche and at Saint-Cyr, from which he entered the artillery of the Royal Guard in 1815 as a sublieutenant. He served in Spain in 1823, made the campaign of the Morea in 1828, joined the first expedition to Algiers in 1830, and in 1839 returned to Algeria with the rank of lieutenant colonel. In 1845 he acquired an unenviable notoriety by putting to death by suffocation some 600 Arabs who took refuge in the caves of the Dahra and refused to surrender. By 1850 Péliissier had attained the rank of general of division. When the news of the coup d'état of Dec. 2, 1851, reached Algeria, he espoused the cause of the Emperor and placed the province under martial law until order was restored. In the Crimean War he was given command of the First Army Corps, and early in 1855 he succeeded Marshal Canrobert in the chief command. After the fall of Sebastopol Péliissier received a marshal's baton, and on his return to France was created Duke of Malakoff and a Senator and was granted a large pension. He was also made a member of the Order of the Bath by Queen Victoria. In 1858 he went to London as French Ambassador, but resigned in the following year a post for which he had little relish. He was then named Governor-General of Algeria, and died at Algiers May 22, 1864.

PELL, JOHN (1610-85). An English mathematician, born at Southwick in Sussex. He was educated at Steyning and at Trinity College, Cambridge. He was a remarkable student, having at the age of 20 mastered Hebrew, Greek, Latin, Arabic, Italian, French, Spanish, and Dutch, and having shown much proficiency in mathematics. He was elected to the chair of mathematics at Amsterdam in 1643. By the invitation of the Prince of Orange (1646) he accepted the professorship of mathematics at Breda. He returned to England a few years later (1652) and was made political agent to the Protestant cantons in Switzerland by Cromwell in 1654. Returning again to England in 1658, he entered the ministry (1661) and became rector of Fobbing and vicar of Laindon, both in Essex County, which offices he retained till his death. He was chosen fellow of the Royal Society in 1663 and in the same year became domestic chaplain to Dr. Sheldon, Bishop of Canterbury, and took the degree of doctor of divinity. But his interest in philosophy and mathematics unfitted him for the ministry, leading him to neglect his clerical duties in pursuit of more congenial studies. Pell was influential in the matter of fixing the symbolism of algebra. The division symbol \div is commonly attributed to him, although it was due to Rahn (Rhonius), whose work, translated by Branner, Pell changed, enlarged, and edited under the title *An Introduction to Algebra* (London, 1668). His name is associated with a certain equation, $x^2 - ay^2 = 1$, although he had but little to do with it. For the history and theory of this equation, consult Whitford, *The Pell Equation* (New York, 1912). His

most important mathematical works are: *A Refutation of Longomontanus's Pretended Quadrature of the Circle* (1646; in Latin, 1647); *A Table of 10,000 Square Numbers* (1672); *An Antilogarithmic Table*, computed with the aid of Walter Warner (c.1630-40), now lost; *An Idea of Mathematics* (1650) and a collection of some 40 folio volumes of letters and papers preserved in the British Museum.

PEL/Ā (Lat., from Gk. Πέλλα). An ancient city, situated in the southeastern part of Macedonia, on the river Ludias, which formed around it impassable marshes, the present Lake of Janitza. At the end of the fifth century B.C. it was the capital of King Archelaus. It first grew to a town of importance under Philip II, and became celebrated as the birthplace of Alexander the Great. It was the capital of the Macedonian kings from Antigonos Gonatas to Perseus, and in its acropolis they kept their treasure. By the Romans it was made a colony and seems to have enjoyed some prosperity, but under the later Empire it gradually declined. The name seems to have clung to a spring not far from Janitza, and the ruins of the town are to be found at the neighboring Palatitza, where parts of a large palace have been excavated. Consult Heuzey and Daumet, *Mission archéologique en Macédoine* (Paris, 1876), and Adolf Struck, *Makedonische Fahrten* (2 vols., Sarajevo, 1908).

PELLA. A city in Marion Co., Iowa, 48 miles by rail southeast of Des Moines, on the Chicago, Rock Island, and Pacific Railroad (Map: Iowa, E 3). It is the seat of Central College (Baptist) and contains an old people's home and the Carnegie-Viersen library. The industrial establishments include feeder works, a canning and pickle factory, roller mills, brick and tile works, a wagon factory, furniture mills, and a tank and pipe factory. The water works and electric-light plant are owned by the city. Pop., 1900, 2623; 1910, 3021. Pella is inhabited for the most part by Hollanders, who began a settlement here in 1847.

PELLA'GRA (Neo-Lat., from It. *pelle agra*, smarting skin). A severe, acute, and chronic disease, nonhereditary, noncontagious, of unknown origin.

History. The malady dates back in Europe to the beginning of the eighteenth century, soon after the introduction of maize into Spain, where it was first observed and described by Gaspar Casal (1691-1759), who mentioned it in his *Historia natural y médica del principado de Asturias* (Madrid). This work was written in 1735, but not printed until 1762, although the first published report about pellagra, in the *Journal de Médecine* (Paris) in 1755, was prepared by François Thiéry, not from his own observations, but based upon Casal's experience. Casal called the disease "mal de la rosa," while the name "pellagra" originated in Italy, where Francesco Fropoli described it in his *Animadversiones in Morbum vulgo Pelligram* (Milan, 1771). In Italy the disease was noticed soon after its appearance in Spain and spread from there to France (1818), the Balkan states, Rumania (1833), Hungary, Egypt, and even to England. Lately it has been observed in the United States where it has increased largely in the South since 1908.

Etiology. The disease may be said to be endemic between lat. 42° and 46° N. and long. 9° W. and 28° E. The exact etiological factor

in the production of pellagra is not definitely known. Six theories have been advanced: 1. The zeistic theory of Bellardini (1845) and Lombroso (1860), giving as the cause a food intoxication from excessive use of altered maize, similar to ergotism (q.v.); this theory was also supported by Neusser (1887), who believed that corn contained a nontoxic glucoside produced by the *Bacillus maidis*, which, becoming decomposed in the human intestine, set free a toxic substance. 2. The photodynamic theory of Raubitscheck (1909), who believed that pellagra was the result of some toxic substance which became active only when sensitized by direct sunlight. 3. The parasitic theory. A parasite, which seemed to be a *Streptococcus*, was isolated by Peltauf and Heider, Zuboni, Tizzoni, and others. This theory was supported by Sambon (1910), who thought that the parasite was being carried and transmitted by the *Simulium* fly in a way analogous to the action of the mosquito in yellow fever (q.v.); and he therefore classified pellagra as a protozoan disease, allied with syphilis and trypanosomiasis. Harris, of New Orleans (1912), was able to produce pellagra in monkeys by inoculating the animals with a filtrate from a case of human pellagra. He believed that the disease was due to a filterable virus capable of passing through a Berkefeld filter. This theory received important support from the Illinois Pellagra Commission and from the Thompson-McFadden Commission (Siler, Garrison, and MacNeal), although Edward Francis, of the United States Public Health Service, was not able to produce the disease in monkeys. 4. The cottonseed-products poison theory advanced by Mizell (1911), which, like the zeistic theory, rested on malnutrition. 5. The drinking-water theory of Alessandrini and Scala (1913), blaming the silica which exists in colloidal solution in drinking water. 6. The starvation theory, or, as suggested by Meyer and Voegtlin (1914), the chronic-intoxication theory, attributing the disease to some poison taken in excess in a largely vegetable diet.

Description. The disease appears in two forms. The chronic form is characterized by symmetrical erythema, appearing usually in the spring, and associated with stomatitis, diarrhea, gastric disturbances, and general malnutrition, followed by profound nervous and mental disturbances, such as headache, backache, spasms, and paralyzes, melancholia, and suicidal mania. As summer advances, the symptoms usually disappear, but recur with the following spring in a more pronounced and enduring form. The acute or fulminating variety of pellagra, called by Lombroso the typhoid form, runs a course of from three weeks to three months and invariably ends fatally.

Treatment. No satisfactory treatment has yet been found. Cases are treated variously according as one theory or another is held regarding the origin. In general, improvement in hygienic surroundings, baths and douches, and a liberal diet, especially of fresh milk, eggs, legumes, and fresh, lean meat with the exclusion of all corn products, combined with tonics, are valuable. Special attention should be paid to the drinking water, seeing that excess of colloidal silica is overcome by calcium carbonate. Good results have been obtained from the use of hexamethylenamine, cacodylate of soda, and salvarsan (q.v.). The transfusion of healthy

blood into the veins of pellagrins has also been tried with some measure of success.

Statistics. Pellagra appears in a more severe form in the United States than in Europe. The governments of the several States have taken steps to exterminate or at least curb the disease. The Italian statistics give interesting material: in 1784 one out of every 20 of the population presented symptoms of pellagra; in 1817, one out of every five or six; in 1827, one-third of the population was affected; in 1888, 117 per million; in 1903, 80 per million; and in 1908, 39 per million, while 7.9 per cent of the insane were pellagrins. In Rumania 40,000 pellagrins were estimated in 1907 in a population of about 6,200,000.

For the United States we find that, for 1900, 2 deaths were reported as from pellagra; 1903, 2; 1904, 1; 1908, 23; 1909, 116; 1910, 368; 1911, 659; 1912, 674; 1913, 1015. For 1913, as for previous years, the excess of females over those of males was very large, 708 females to 307 males. Also the cases among colored people were greatly in excess of those among the white population. But these reports are not true representations of the actual increase in the morbidity, as the registration area in the United States does not include the greater part of the territory in which the disease prevails.

For the period 1907-11, inclusive, Surgeon C. H. Lavinder, of the United States Public Health Service, has compiled some interesting statistics, not based on actual figures throughout, but on all data available:

STATES	Cases reported	Deaths reported	Cases reported and estimated
Virginia	628	349	reported, 15,870 not reported, but estimated, 4,000
North Carolina	2,412	1,067	
South Carolina	1,880	582	
Georgia	4,558	1,582	
Kentucky	513	220	
Alabama	2,314	859	25
Mississippi	2,895	1,250	
Louisiana	670	296	
Maryland			
Tennessee			
Florida			
Arkansas			
Texas			
Illinois and			
Pennsylvania			
All other States			200
Total			25,545

Bibliography. *Transactions of the National Association for the Study of Pellagra* (Columbia, S. C., 1912); C. H. Lavinder, *The Prevalence and Geographic Distribution of Pellagra in the United States* (Washington, 1913); Goldberger and Lorenz, *Cause, Prevention and Treatment of Pellagra* (ib., 1914); Goldberger, Waring, and Willets, *The Treatment and Prevention of Pellagra* (ib., 1914); Alessandrini, Giulio, and Scala, *Contributo nuovo alla etiologia e patogenesi della pellagra* (Rome, 1914).

PELLAT, pà'là' (JOSEPH SOLANGE) HENRI (1850-1909). A French physicist, born at Grenoble. He studied in Paris at the Ecole Normale Supérieure, was assistant in physics at the Paris Observatory (1874), and taught in various lycées until 1893, when he was named adjunct in the scientific faculty of the University of Paris. In 1899 he was promoted to a full professorship. Pellat's especial field of

research was electricity. On thermodynamics also he wrote for the *Journal de Physique* and the *Comptes Rendus*. He invented an electro-dynamometer balance, and other apparatus for the measure of specific inductivity, and wrote *Cours de physique* (1884-86) and *Cours d'électricité* (1901-08), etc.

PELLATT, pèl'at, SIR HENRY MILL (1859-). A Canadian capitalist. He was born in Kingston, Ontario, removed to Toronto in his youth, and was educated at Upper Canada College. Entering the financial service of his father, a stock and money broker, in 1874, he was taken into partnership in 1881 and in 1891 became head of the firm of Pellatt and Macrae. He took a prominent part in the development of electrical power at Niagara Falls and also in the promotion of mining interests in Ontario. He was made president of, or director in, several financial and industrial corporations and contributed largely to various educational and charitable institutions. Pellatt was actively interested in the volunteer militia service, becoming lieutenant colonel commanding the regiment of Queen's Own Rifles in 1906 and colonel in 1907. He commanded the Canadian contingent at Edward VII's coronation in 1902, was knighted in 1905, and was made Commander of the Royal Victorian Order in 1910.

PELLEAS ET MÉLISANDE, pèl'â's' à mǎ'lé'zǎnd'. An opera by Debussy (q.v.), first produced in Paris, April 30, 1902; in the United States, Feb. 19, 1908 (New York).

PELLEGRINO, pèl'lâ-grê'nô, TIBALDI. See TIBALDI, PELLEGRINO.

PELLETAN, pèl'tǎn', CHARLES CAMILLE (1846-1915). A French politician, son of P. C. E. Pelletan. He was born in Paris, studied at the Ecole des Chartes, and entered the political press with boldly republican attacks on the Empire. He became editor of *La Justice* with G. Clémenceau in 1880 and in the following year was elected to the Chamber of Deputies, where he voted with the Radical Left. He was an active opponent of Boulanger. From 1902 to 1905 he held in the Combes cabinet the portfolio of the Navy and came near causing international complications because of his ill-advised speeches in which he foreshadowed a great war of conquest for France. His publications include: *Le théâtre de Versailles* (1876), a collection of his reports on the meetings of the National Assembly; *Question d'histoire: Le comité central et la Commune* (1879); *Georges Clémenceau* (1883); *Les guerres de la Révolution* (1884; 2d ed., 1894); *De 1815 à nos jours* (1892); *Histoire contemporaine* (1902); *Victor Hugo* (1907).

PELLETAN, PIERRE CLÉMENT EUGÈNE (1813-84). A French politician and publicist, father of C. C. Pelletan, born at Royan. He was educated at Poitiers and Paris, was engaged in journalistic work in the latter city from 1837, and incurred the displeasure of the government by the freedom with which he voiced his political convictions. In 1863 he was elected to the Chamber of Deputies, where he sided with the Opposition, and became in 1868 chief editor of the *Tribune Française*, of which he had been a founder. During the Franco-Prussian War he was a member of the Government for National Defense; in 1871 he was elected to the National Assembly and in 1876 to the Senate. Three years afterward he became Vice President of the Senate and in 1884 permanent Senator. He was the

author of *La lampe éteinte* (1840); *Histoire des trois journées de février, 1848* (1848); *Heures de travail* (1854); *Les droits de l'homme* (1858; 2d ed., 1867); *Décadence de la monarchie française* (1860; 3d ed., 1863); *La nouvelle Babylone* (1863); *Elisée: voyage d'un homme à la recherche de lui-même* (1877); *Dieu est-il mort?* (1883). The friendship between Lamartine and himself was dissolved by the publication of Pelletan's *Profession de foi du XIXième siècle* (1852; 3d ed., 1874), *Lettres à un homme tombé* (1857), and *Le monde marche* (1857).

PELLETIER, pèl'tyâ', SIR CHARLES ALPHONSE PANTALÉON (1837-1911). A Canadian statesman, born at Rivière Ouelle, Quebec Province. He was educated in the Ste. Anne de la Pocatière College and Laval University, called to the bar in 1860, and became queen's counsel in 1879. He served in the Fenian Raid of 1866, represented Kamouraska as a Liberal member in the Dominion Parliament in 1869-77 and Quebec East in the Quebec Legislative Assembly in 1873-74, resigning the latter seat on the abolition of dual representation. He was made a Senator in 1877, served as Minister of Agriculture in the Dominion cabinet of Alexander Mackenzie in 1877-78, and was president of the Canadian commission at the Paris Exposition in 1878. He was Speaker of the Dominion Senate in 1896-1901 and became judge of the Superior Court of the Province of Quebec in 1905. Resigning this position in 1908, he was appointed Lieutenant Governor of Quebec, an office which he filled until his death. In 1898 he was knighted (K.C.M.G.).

PELLEW, pèl'wô, EDWARD. See EXMOUTH, VISCOUNT.

PELLEW, HENRY EDWARD (1828-). An American social reformer, son of Dr. George Pellew, dean of Norwich Cathedral, England. He was born at Canterbury and graduated M.A. from Trinity College, Cambridge, in 1853 and in 1870 from Oxford, where he helped found Keble College. Early identified with the work of London hospitals and charities, in 1873 he came to the United States and in association with Theodore Roosevelt, Sr., Abram S. Hewitt, and others organized the New York Bureau of Charities. Night refuges, coffee houses, tenement-house reform, and free circulating libraries were all benefited by his efforts. After 1888 he resided in Washington, D. C., where he paid particular attention to the work among the negroes and to the building of the Washington Cathedral of the Protestant Episcopal church. Pellew served at various times as president of the Association for Improving the Condition of the Poor and of St. George's Society, both in New York.

PELLICANUS (Neo-Lat., skinner, furrier, from Lat. *pellis*, skin; a translation of his German name, *Kürschner*), CONRAD (1478-1556). A Swiss linguist and reformer. He was born at Ruffach in Alsace, studied for a short time at Heidelberg, entered a Franciscan monastery in his native town, and was later transferred to Tübingen. Subsequently he became professor at Basel. He gradually shifted towards Protestantism and in 1526 threw aside his cowl and in the following year became professor of Hebrew at Zurich. He published the first Hebrew grammar written in a European language (1504; reprinted in phototype, 1877); his other works are an autobiography (published in Latin at Basel, 1877, and in German, Strassburg, 1891)

and a biblical commentary in seven volumes (1532-39). Consult Reuss, *Konrad Pellicanus* (Strassburg, 1893), and Silberstein, *Conrad Pellicanus* (Berlin, 1900).

PELLICO, pèl'lè-kò, SILVIO (1788-1854). An Italian poet, celebrated for his long and cruel imprisonment by the Austrians. He was born June 24, 1788, at Saluzzo in Piedmont. In his sixteenth year he went to Lyons, where he stayed, giving his time mostly to French literature, until Foscolo's *Carme de' sepolcri* awakened in him a strong patriotic feeling and an irresistible longing to return to Italy. About 1810 he went with his family to Milan, where he was professor of French in the Collegio degli Orfani Militari, and he also served as tutor in the family of Count Porro, in whose house the most distinguished men in Milan were wont to meet. His tragedy *Francesca da Rimini* (1818), weak in plot, character delineation, and style, brought him popular applause through its sincere Italian sentiment. He was editor in chief of a liberal periodical called *Il Conciliatore*, which for its nationalistic propaganda was suppressed. For belonging to the Carbonari (q.v.) Pellico was arrested in 1820 and sent to the prison of Santa Margherita at Milan, where his friend the poet Maroncelli was also confined. In 1822 he was taken to the prison on the isle of San Michele, near Venice. Maroncelli and he were at last condemned to death; but the Emperor commuted the sentence to 20 years' imprisonment for Maroncelli and 15 years for Pellico. In March, 1822, they were both conveyed to the subterranean dungeons of the Spielberg, near Brünn, in Moravia. In August, 1830, however, they were set at liberty. Pellico published an account of his sufferings during his 10 years' imprisonment under the title *Le mie prigioni* (1832). His health had been permanently injured. The Marchioness of Barolo received him into her house at Turin as her secretary. He died at Turin, Jan. 31, 1854. His 12 tragedies, eight of which he published, and nearly all of which deal with mediæval subjects, and the verse novels and lyrics (*Poesie inedite di Silvio Pellico*, Turin, 1837) and *Poesie* (Florence, 1869), written between 1834 and 1837, have small merit. Pellico is sentimental, but his piety is sincere. His sufferings of mind and of body broke down his belief in the right to resist. In his later life he claimed that Providence must accomplish the redemption of Italy. His correspondence (*Epistolario*, Florence, 1856, and later editions, 1858, 1861, 1874, 1877) reveals his tendency to mystical contemplation. His fame rests on a narration of extraordinary simplicity and beauty, free from resentment or partisanship and breathing faith in the underlying goodness of humanity. The style has a natural elegance which compares well with that of Manzoni. *Le mie prigioni* has been translated into many languages. Consult: Bourbon, *Silvio Pellico, sa vie et sa mort* (Paris, 1879); Ilario Rinieri, *Della vita e delle opere di Silvio Pellico* (Turin, 1899-1901); L. Mancini, *Le tragedie di Silvio Pellico avanti la sua prigionia* (Senigallia, 1899); Egidio Belforini, "Le idee letterarie di Silvio Pellico," in *Giornale Storico*, vol. xlvii (Turin, 1906); Ricarda Huch, *Das Risorgimento* (Leipzig, 1908).

PELLISOV, pèl'lè-zòf, EMIL. See SCHAF-HÄUTL, KARL FRANZ EMIL VON.

PELLISSIER, pèl'lès-yà', GEORGES (1852-). A French critic, born in Monflanquin (Lot-et-Garonne). He contributed to many periodicals, especially to *La Revue*, for which he was the monthly literary critic with E. Faguet. He showed great independence in the Dreyfus case and afterward. He was created Knight of the Legion of Honor. He wrote several books, but especially is famous for his remarkable *Mouvement littéraire au XIX siècle* (1889), followed in 1901 by *Mouvement littéraire contemporain*. He was also professor of rhetoric at the Lycée Janson-de-Sailly, Paris (1904). His articles are gathered in several volumes as *Essais de littérature contemporaine* (1893); *Nouveaux essais* (1894); *Études de littérature contemporaine* (1901); *Précis de l'histoire de la littérature française* (1902), an excellent manual; *Études de littérature et de morale* (1905); *Voltaire philosophe* (1908); *Anthologie du théâtre français contemporain* (1910); *Anthologie des prosateurs français* (1910-13); *Anthologie des poètes du XIXe siècle* (1911); *Le dix-huitième siècle par les textes* (1911); *Le réalisme du romantisme* (1912); *Shakespeare et la superstition shakespearienne* (1914).

PEL'LITORY (Lat. *parietarius*, belonging to walls, from *paries*, wall: corrupt. from *paritory*) **OF SPAIN**, *Anacyclus pyrethrum*. A plant of the family Composite. Its small, spindle-shaped, fleshy, acrid root has very often been used medicinally in parts of Europe and in northern Africa, where it is native. *Anacyclus officinarum* yields the German pyrethrum root.

PELOP'IDAS (Lat., from Gk. Πελοπίδας) (?-364 B.C.). A Theban general and patriot, the associate of Epaminondas. He belonged to a good family and was in affluent circumstances. In 382 B.C. he was driven from Thebes by the oligarchic party, supported by the Spartans, and took refuge at Athens, but returned with a few associates in 379 B.C., recovered possession of the Cadmeia (or citadel), slew the Spartan leader, Leontiades, with his own hand, and established a democratic form of government. His Sacred Band of Theban youth, 300 in number, contributed largely to the victory of Epaminondas at Leuctra (371), but failed in a subsequent attack on Sparta itself. In the expedition of the Thebans against the cruel tyrant Alexander of Phœræ (368) he was treacherously taken prisoner, when in the character of an ambassador, but was rescued by Epaminondas in the following year. He was then sent (367) to Susa as Ambassador from Thebes. In 364 he defeated Alexander of Phœræ at Cynoscephalæ, but was himself killed. Consult Plutarch's and Nepos's *Life of Pelopidas*.

PELOPONNE'SIAN WAR. See GREECE.

PELOPONNE'SUS (Lat., from Gk. Πελοπόννησος, island of Pelops). The ancient name of the peninsula forming the southern part of ancient Greece, now called the Morea (q.v.). It is separated from the mainland by the Corinthian and Saronic gulfs and united with it only by the narrow Isthmus of Corinth. It was divided into six districts: Argolis, on the northeast; Laconia, on the southeast; Messenia, on the southwest; Elis, on the west; Achæa, on the north; and Arcadia, in the centre. The most famous cities were Mycenæ, Sicyon, Tiryns, Corinth, Argos, Trœzen, and Epidaurus in Argolis, Sparta in Laconia, Messene, Pylos, and Methone in Messenia, Elis in Elis, Patræ and

Ægium in Achæa, and Tegea, Mantinea, and Megalopolis in Arcadia. After the conquest by the Dorians the supremacy of Sparta in the Peloponnesus was established and was maintained until the battle of Leuctra (371 B.C.), which was followed by the Theban invasion under Epaminondas (q.v.), the restoration of the Messenians, and the founding of Megalopolis (q.v.). The Peloponnesus was the scene of internal strife until the Roman conquest (146 B.C.), when it became part of the Province of Achaia. Consult: W. M. Leake, *Travels in the Morca* (London, 1830); Blouet, *Expédition scientifique du Moroc* (Paris, 1831-38); W. M. Leake, *Peloponnesiaca* (London, 1846); Ernst Curtius, *Peloponnesos* (Gotha, 1851-52); Alfred Philippson, *Der Peloponnes* (Berlin, 1892). See GREECE, *History*.

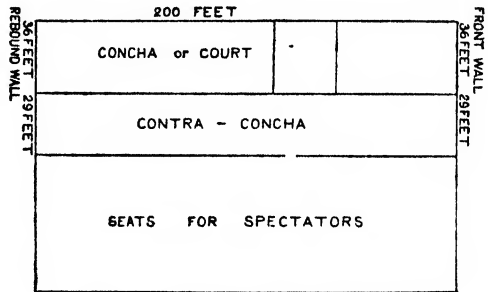
PELOPS (Lat., from Gk. Πέλοψ). In Greek legend, the son of Tantalus, King of Phrygia. His father was especially loved of the gods, but at a feast at which they were present he slew and served to them his son. The gods, recognizing the nature of the food, refused it, with the exception of Demeter, who, absorbed in grief at the loss of her daughter, devoured a shoulder. At the command of Zeus, Hermes threw the members into a caldron from which Clotho drew the boy restored to life, while Demeter replaced the lost shoulder by one of ivory. Later legend told of the love of Poseidon for the beautiful youth, and his gift to Pelops of winged horses of matchless speed, by whose aid and the treachery of Myrtilus he was enabled to win the hand of Hippodamia, daughter of Ænomaus, King of Elis. Each suitor was required to take Hippodamia in his chariot and start from Olympia for Corinth, while Ænomaus offered a sacrifice to Zeus and then pursued. As his horses were a gift of the gods, Ænomaus had hitherto overtaken and slain 13 luckless lovers. Pelops bribed Myrtilus, Ænomaus' charioteer, to draw the linclpin and thus secured the victory and the death of Ænomaus. He, however, refused to pay Myrtilus his reward and even cast him into the sea, wherefore Myrtilus cursed the whole race of Pelops. It may be observed that the Homeric poems know nothing of this curse and the subsequent horrors, which furnished so much material to the Attic dramatists. While the ordinary versions localized this story at Olympia and associated the Olympic games with Pelops, there are many indications that the race was in some versions considered as crossing the water to or from Lesbos. Of the later fortunes of Pelops many versions were current. He was the father by Hippodamia of Atreus, Thyestes, and other children, and by Axioche of Chrysippus, who was carried off by Laius of Thebes, or murdered by his jealous brothers and stepmother, thus beginning the woes of the family. At Olympia Pelops was especially honored in a sacred inclosure, the Pelopion, where a black wether was yearly offered to him.

PELO'RIA (Neo-Lat., from Gk. Πέλωρ, *pelôr*, monster). A malformation occurring in flowers which are normally irregular, by which regularity is again attained. It was first described by Linnaeus, who found the spurred flowers of the butter and eggs, or toadflax (*Linaria vulgaris*), with five spurred petals instead of the normal one. The cause of such malformations has not been fully determined, though peloria has been produced by a change in the relation

of the plant to light, one-sided illumination appearing favorable to its development.

PELO'RUS. See COMPASS.

PELOTA, pá-lô'tà, or JAI ALAI (Sp., from *pilota*, *pelota*, little ball, from Lat. *pila*, ball). A Basque game introduced into the South American republics and to Cuba from the northern provinces of Spain and imported thence to the United States. It can be played either in or out of doors. Its necessities are a *concha*, or court, with level concrete floor 200 feet long and 65 feet wide, with a wall 36 feet square, called the *frontis*, or front wall, at one end, and at the opposite another similar wall, called *la pared de rebote*, or rebounding wall. On the front wall iron strips painted red mark the boundaries within which the ball must strike. On the floor of the court, occupying the whole space between the two ends, are also boundary



lines within which the ball must, on its rebound, strike to be counted. A narrow strip, 29 feet, parallel with the concha is the *contra-concha*, within which the ball must remain to avoid being counted as a fault. The instrument with which the game is played is a light wickerwork basket arrangement fastened to the hand by means of a glove attachment. It is called a *cesta*. The ball is about the size of a lawn-tennis ball. It has a core of India rubber bound round with yarn and is covered with sheepskin, or it may be made of solid rubber.

The game is played by four, six, or eight players, mostly by four, two on each side, one of whom on each team is the *delantaro*, or forward, and the other the *zaguero*, or back. Play is on when the forward of the side first entitled to do so runs to a certain mark on the court and throws the ball to the floor, catching it on the bound in the basket attached to his hand and striking it against the front wall within the red-lined boundaries, whence it should rebound so as to touch the floor between the lines thereon defined. The forward of the opposing side must then strike it with his basketed hand either while it is in the air as it rebounds or on its first bound from the floor and throw it against the front wall again; and so on by each team in turn until one side loses the point. If the ball falls or strikes outside the boundaries, it is a fault to the credit of the opponent. No player may hold the ball in his hand or in the basket; it must always be kept in motion. The first team to gain 50 points wins the game.

PELOTAS, pá-lô'tàs. A town in the State of Rio Grande do Sul, Brazil, 26 miles northwest of the city of that name, on the São Gonçalo River and the Rio Grande Railways (Map: Argentina, J 4). It is a well-built, handsome city and the centre of an extensive interior and

coastwise trade. The principal industry is the curing and preserving of meats, and in addition there are extensive exports of hides, horns, and tallow. Pop. (est.), 32,000.

PELOUBET, pel'oo-bét, FRANCIS NATHAN (1831-). An American biblical scholar, born in New York City. He graduated at Williams in 1853 and at Bangor Theological Seminary in 1857 and for 25 years was pastor of Congregational churches in Massachusetts. In 1884 and 1912 he revised Smith's *Bible Dictionary*. Peloubet's *Select Notes on the International Sunday-School Lessons* (1875-1912) and his *Sunday-School Quarterlies* (1880-1912, in four grades) became widely known. He was also author of *Suggestive Illustrations on Matthew, John, and Acts* (3 vols., 1898-99); *Loom of Life* (1900); *Front Line of the Sunday-School Movement* (1904); *Studies in the Book of Job* (1906); *Oriental Light Illuminating Bible Texts and Bible Truths* (1914). With A. D. Adams he edited the *International Bible Dictionary* (1914).

PELOUZE, pe-looz', THÉOPHILE JULES (1807-67). A French chemist. He was assistant to Gay-Lussac and later professor of chemistry at the Ecole Polytechnique and the Collège de France. In 1836 he was associated in research work with Liebig and in 1837 became a member of the Institute. Pelouze carried out a number of valuable investigations in organic and industrial chemistry and published several works; jointly with Frémy he wrote a *Traité de chimie générale*, which passed through several editions.

PELTIER, pèl'tyá', JEAN CHARLES ATHANASE (1785-1845). A French physicist and meteorologist, born at Ham (Somme). He was early a watchmaker, but gave up his craft at the age of 30 to apply himself to experimental science. He made several important discoveries in electricity and meteorology. The so-called Peltier Effect discovered by him involved the production of cold by the passage of an electric current through a joint of dissimilar metals. He published a number of interesting memoirs, including *Mémoire sur la météorologie électrique* (1844); also an excellent work on water spouts entitled *Météorologie: Observations et recherches expérimentales sur les causes qui concourent à la formation des trombes* (1880). Consult Peltier, fils, *Notice sur la vie et les travaux de J. C. A. Peltier* (Paris, 1847), and "Memoir of Peltier," in *Smithsonian Report* for 1867.

PELTRIE, pèl'trè', MADAME DE LA (c.1602-71). A French church benefactor. She was born in Alençon, Normandy. After the death of her husband she came to Quebec, Canada, about 1637 and devoted her wealth to the founding of the Ursuline convent in that city. She was associated in this work with Madame Martin, better known as Mary of the Incarnation (q.v.).

PELU'SIOTA. See ISIDORUS, SAINT.

PELU'SIUM (Lat., from Gk. Πηλουσίον, mud city; Egypt. Am; probably, though not certainly, identical with the ancient *Avaris* and the *Sin* of the Old Testament; also called, in Coptic and Arabic, *Pérémoun*, *El-Fermâ*, *Far-amâ*). An ancient Egyptian city, situated a few miles from the Mediterranean, at the extreme northeast corner of the delta of the Nile, important as the key of Egypt on the Asiatic side. The easternmost mouth of the Nile derived from it the name Pelusiac. Pelusium was

the last stronghold of the Hyksos and was finally taken by Amasis I. It was the scene of Sennacherib's defeat (2 Kings xviii, xix). On this occasion, according to Herodotus, the camp of the Assyrians was invaded at night by a host of field mice, who gnawed their bowstrings and shield straps, so that in the morning, when the Egyptians fell upon them, they were defenseless. In 525 B.C. the Persians, under Cambyses, defeated the forces of Psammetichus III near Pelusium and overthrew the native Egyptian dynasty. The city was taken by Iphicrates and Pharnabazus in 374 B.C. and was besieged and conquered by the Persians in 369 B.C. In 170 B.C. it was the scene of the defeat of Ptolemy Philometor by Antiochus Epiphanes, and in 55 B.C. it was captured by Marcus Antonius. After the battle of Actium in 31 B.C. it fell into the hands of the Romans. It was, according to one account, the birthplace of Ptolemy the astronomer. At present the place is in ruins and nearly level with the surrounding country. Consult: Johannes Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1879); Meyer, *Geschichte des Alterthums* (Stuttgart, 1884-93); W. M. Flinders Petrie, *Tanis* (London, 1885-88); E. Amélineau, *Géographie de l'Égypte à l'époque copte* (Paris, 1893); article "Pelusium" in Friedrich Lübker, *Reallexicon des klassischen Alterthums*, vol. ii (8th ed., Leipzig, 1914).

PELVIC GIRDLE (from Lat. *pelvis*, basin; connected with Gk. πέλνῃ, *pelyx*, πέλλις, *pellis*, πέλλα, *pella*, bowl). The pelvic girdle is that part of the vertebrate skeleton which serves for the connection of the hind limbs with the back. Among fishes there is no true girdle, although cartilaginous plates and rods lying in the muscular tissues of the ventral side, and often connected with the pelvic fins, are regarded as rudiments of such a structure. These are best developed in dipnoid fishes, but are quite distinct in the sharks and rays. In the Batrachia we find a well-formed pelvic girdle made up of three parts—a dorsal ilium, an anterior ventral pubis, and a posterior ischium. Each part is made up of a pair of bones, one on each side of the body, and the iliac bones are connected with the sacral vertebrae; the femur articulates with the pelvis at a point known as acetabulum, where the iliac, pubic, and ischial bones meet. In some salamanders an epipubis is present, consisting of a slender bifurcated rod of cartilage projecting forward from the anterior edge of the pubis. In frogs and toads the iliac bones are very long, while the ischium and pubis are completely fused with the posterior portion of the ilium into a single piece. Among reptiles the same essential elements are present in the pelvic girdle, and the pubic and ischial bones are united ventrally, more or less perfectly. In crocodiles there is a prolongation of the iliac bone in front of the acetabulum. In birds this prolongation is very marked, but the relative proportion of anterior and posterior parts of the ilium differs greatly in different birds. The pubic bones of birds extend backward parallel with the ischial and in many birds fusing with them. All the parts of the pelvis of birds tend to become ankylosed, but a pubic symphysis is present only in the ostrich, and an ischial symphysis occurs only in the rhea. Among mammals the pelvic girdle shows much variety. Both pubic and ischial symphyses occur in monotremes, marsupials, many rodents,

insectivores, ungulates, and carnivores. The pubic symphysis is wanting in bats and some insectivores, while the ischiac symphysis fails in many insectivores and carnivores and in the primates. In monotremes and marsupials there are present well-developed epipubic bones, known as marsupial bones, though they are not concerned in any way with the marsupium; they are associated with the muscles governing the mammary glands. A fourth element, the pars acetabularis, enters into the formation of the pelvis in the crocodile, birds, and many mammals, and it often shuts the pubis out from a part in forming the acetabulum; occasionally the ischiac bones are also excluded, as in the mole. The pelvic girdle has no fixed position throughout any class, but varies greatly according to the position and function of the hind legs. A pelvis is lacking in the apodous batrachians, in all snakes (with rare exceptions), in a few lizards, and in the Sirenia and Cetacea it is either wanting or reduced to a rudimentary ilium. Consult R. E. E. Wiedersheim, *Comparative Anatomy of Vertebrates*, translated by W. N. Parker (3d ed., New York, 1907).

PELVIC INDEX. See INDEX.

PELVIS (Lat., basin). A bony ring interposed between the spinal column and the lower extremities, so as to transmit the weight of the former to the latter. It is made up of four bones, viz., the two ossa innominata, which constitute its sides and front, and the sacrum and coccyx, which complete it behind. The os innominatum receives its name from its bearing no resemblance to any known body and is a large irregular-shaped bone. In the young subject it consists of three segments, which meet and form the cup-shaped cavity (the acetabulum) in which the head of the thigh bone rests. Hence it is usual to describe this bone as consisting of the ilium, the ischium, and the pubes.

usually feel the part through which the weight is transmitted. The pubes is that portion which runs horizontally inward from the inner side of the acetabulum for about 2 inches and then descends obliquely outward for about the same length, thus making an acute angle with its original direction. The former part is called the body, and the latter the ramus, of the pubes. The ramus is continuous with the ramus of the ischium. Between the ischium and the pubes is a large aperture, known as the thyroid or obturator foramen, which in the living body is closed by a membrane termed the obturator membrane. The object of this large foramen is probably to give lightness to the parts without materially diminishing their strength.

The pelvis, considered as a whole, is divisible into a false and a true pelvis. The false pelvis is all that expanded portion which is bounded laterally by the iliac bones, and lies above the prominent line termed the linea ileo-pectinea; while the true pelvis is all that part of the general pelvic cavity which is situated below that line. The broad, shallow cavity of the

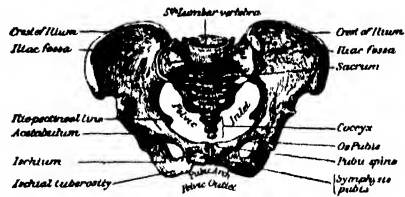


FIG. 2. PELVIS (FEMALE ADULT) SEEN FROM THE FRONT.

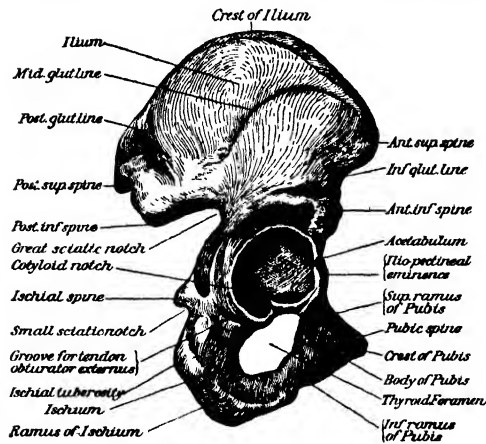


FIG. 1. OS INNOMINATUM OF THE RIGHT SIDE (outer surface).

The ilium is the superior, broad, and expanded portion which forms the prominence of the hip and articulates with the sacrum. The ischium is the inferior and strongest portion of the bone. It consists of a thick and solid portion, the body (whose inferior border is termed the tuberosity), and a thin ascending portion, the ramus. In the ordinary sitting position the weight of the body rests principally on the ischium; and by sitting on the hands we can

false pelvis serves to support the weight of the intestines; while the rectum, bladder, and part of the generative organs lie in the cavity of the true pelvis. The upper aperture of the true pelvis is termed the inlet. It is somewhat heart-shaped in form and has three principal diameters—an anteroposterior (or sacropubic), which extends from the angle formed by the sacrum with the last lumbar vertebra to the symphysis pubis, or point of union of the two pubic bones; the transverse, at right angles to the former and extending across the greatest width of the pelvis; and the oblique, extending from the sacroiliac symphysis (or union) on one side to the margin of the brim corresponding with the acetabulum on the other. The diameters of the outlet are two—an anteroposterior, extending from the tip of the coccyx to the lower part of the symphysis pubis, and a transverse, from the posterior part of one ischiatic tuberosity to the same point on the opposite side. As the precise knowledge of the diameter and depth of the pelvis is of the greatest importance in the practice of midwifery, we give the average numbers representing the dimensions of a well-formed adult female pelvis. Diameters of inlet or brim—anteroposterior, 4.4 inches; transverse, 5.4 inches; oblique, 4.8 inches. Diameters of outlet—anteroposterior, 5 inches; transverse, 4.3 inches. Depth of the true pelvis—posteriorly, 4.5 inches; in the middle, 3.5 inches; anteriorly, 1.5 inches.

The pelvis is placed obliquely with regard to the trunk of the body, the plane of the inlet to the true pelvis forming an angle of from 60° to 65° with the horizon. According to Gray the

extremity of the coccyx is in the female, when standing upright, about $\frac{1}{2}$ inch higher than the lower edge of the symphysis pubis, the upper edge of the symphysis being at the same level as the lower edge of the second segment of the coccyx. The shape of the human pelvis is much affected by the curving forward of the lower part of the sacrum. This bend of the sacrum forward serves to support the viscera when the body is in an erect posture, but it is of much more importance in its relation to the act of parturition. If all the anteroposterior diameters of the true pelvis from the brim to the outlet were bisected, the points of bisection would form a curved line similar to the curve of the sacrum and termed the axis of the pelvis. As the head of the child has to follow this curve, the difficulties of parturition are much greater than if the axis of the pelvis had been straight as in the other vertebrata. Without entering into unnecessary details, we may remark, generally, that the fetal head is usually of oval shape, with its greatest diameter from before backward, and that in its passage through the pelvis it is so placed that its longest diameter at each stage of labor coincides with the longest diameter of the pelvis. The head enters the pelvis with the occiput (or back of the skull) directed towards one ilium and the face towards the other, while at its final emergence the face is turned towards the sacrum and coccyx. This screwlike or rotatory motion facilitates the passage of the fetal head through the pelvis.

There are well-marked differences between the male and the female pelvis. In the female the bones are lighter and more delicate than in the male and the muscular impressions and eminences are less distinctly marked. The iliac fossae are large and expanded, and hence the great prominence of the hips. The several diameters (particularly the transverse diameter of the brim, which measures only 5.1 inches in the male) are somewhat greater, and the pubic arch is wider by about 10 degrees; the sacrum also is wider and less curved.

It is worthy of notice that the pelvis of the negro is smaller in all its dimensions than that of the European and presents a partial approximation to that of the monkey, especially in the deficiency of its width. This difference is more obvious in the male than in the female negro; and parturition in the black races is facilitated both by the sacrum being less curved and by the fetal head being of smaller dimensions. In the apes and monkeys, which approach most nearly to man, the pelvis is longer and narrower and much less curved than in the human subject. In other mammals the differences are for the most part the same in kind, but greater in degree. In many of the *Chiroptera* (bats) and *Insectivora* (as the mole) the pubic bones are only loosely connected by a small ligament, or there is a complete opening between the bones (as occurs normally in birds), an arrangement by which the act of parturition in these animals is much facilitated. The pelvic bones are very simple in the *Cetacea*, in some cases being represented by two plain, elongated bones lying near the anus and converging from opposite sides (a transverse connecting piece being sometimes but not always present); in others by a small V-shaped bone; while sometimes (as in *Manatus*) they seem to be entirely wanting. The additional pelvic bones in the

nonplacental mammals have been already noticed in the article on the *MARSUPIALIA*. In the *Echidna*, which belongs to the *Prototheria* (q.v.), the acetabulum is perforated, as occurs normally in birds. In birds, in addition to the peculiarity just noticed, we find the pelvis open in front (or, more correctly, inferiorly), there being no union of the pubic bones in any bird except the ostrich. This normal incompleteness of the pelvic ring is obviously for the purpose of facilitating the passage of the eggs.

PELZ, pēlz, PAUL JOHANNES (1841-). An American architect. He was born at Seidentorf, Silesia, Germany, studied at colleges in Breslau, joined his father, a political refugee, in the United States in 1857, and in 1859-66 studied architecture under Detlef Lienau in New York. Subsequently he designed many lighthouses for the United States government, but is best known for his work on the Congressional Library Building, Washington; the Georgetown College Academic Building; Carnegie Library and Music Hall, Allegheny, Pa.; United States Government Army and Navy Hospital, Hot Springs, Ark.; Machinery Hall, St. Louis Exposition; Chamberlain Hotel, Old Point Comfort, Va.; Clinic Hospital, University of Virginia.

PEMBA. A coral island on the east coast of Africa, 30 miles north of Zanzibar (Map: Africa, J 5). It is in the dominions of the Sultan of Zanzibar, but under the protectorate of England. It is about 35 miles long, with an area of 380 square miles, covered in the interior by low hills up to 600 feet. It has a luxuriant vegetation and produces rice, maize, and sugar cane, but since the abolition of slavery on the island agriculture has been neglected. The output in recent years has been cloves and coconuts. The population is estimated at 60,000, mostly of Bantu stock. The chief town is Chaka, with a population of 5000.

PEMBERTON. A town in Lancashire, England, 2 miles southwest of Wigan. It has manufactures of cottons, chemicals, bricks, and iron products. There are coal mines and stone quarries in the vicinity. The municipality owns its electric-lighting plant. Pop., 1901, 21,600; 1911, 23,642.

PEMBERTON, JOHN CLIFFORD (1814-81). An American soldier, born in Philadelphia. He graduated at West Point in 1837 and was commissioned second lieutenant of the Fourth Artillery. During the Mexican War he was aid to General Worth and was brevetted captain for gallantry at Monterey and major after Molino del Rey. In 1848 he married Miss Martha Thompson, of Norfolk, Va. On the outbreak of the Civil War he refused to serve against the South. On June 15, 1861, he was commissioned major of artillery in the Confederate army, and on June 17 brigadier general. He served north of the Nansemond River in Virginia until November, 1861, when he was transferred to the Eighth Military District of South Carolina. In January, 1862, he was promoted to be major general and placed in charge of the Department of South Carolina, Georgia, and East Florida. He was promoted to be lieutenant general Oct. 13, 1862, and was placed in charge of Mississippi and east Louisiana, succeeding General Van Dorn. He disobeyed the orders of his superior, General Johnston, to unite with him near Jackson, next to strike General Grant's rear at Clinton, and finally to evacuate Vicksburg. His correspondence with General Johnston was be-

trayed to General Grant, and he was sharply defeated at Baker's Creek or Champion's Hill, May 16, 1863, and at Big Black Bridge the next day. When he retired into Vicksburg he conducted the defense with skill until July 4, when he surrendered 31,600 men and 172 cannon. His course met with so much criticism that he resigned his commission after his exchange, but in May, 1864, was placed in charge of the artillery defenses of Richmond, with the rank of lieutenant colonel, and served here until the end of the war. He then engaged in farming in Virginia until 1876, in which year he removed to Pennsylvania. Consult for Vicksburg, Johnson and Buel (eds.), *Battles and Leaders of the Civil War* (New York, 1887).

PEMBERTON, MAX (1863-). An English romancer, born in Birmingham. After graduating from Caius College, Cambridge, he joined the staff of *Vanity Fair* (1885). He also began writing stories and miscellaneous articles for several London periodicals, was editor of *Chums* (1892-93), and from 1896 to 1906 edited *Cassell's Magazine*. Among his romances are: *The Iron Pirate* (1893); *Queen of the Jesters* (1897); *The Garden of Swords* (1899); *Féu* (1900); *House under the Sea* (1902); *Beatrice of Venice* (1904); *My Sword for Lafayette* (1906); *The Show Girl* (1909); *Captain Black* (1911); *War and the Woman* (1912); *Two Women* (1914); *The Lady Evelyn* (1915). Pemberton also produced the play called *Garriick* in 1913.

PEMBROKE, pēm'brūk. A seaport town, parliamentary and municipal borough, and the capital of Pembrokeshire, Wales, 42 miles west of Swansea (Map: Wales, B 5). Pater, otherwise called Pembroke Dock, an important fortified government dockyard, 2 miles from the town, embraces an area of 90 acres and provides the chief industry of the neighborhood. On the extremity of the ridge on which the town is built are the remains of its extensive castle, founded in 1094, and the birthplace of Henry VII. Beneath the ruins is a remarkable natural cavern, which had communications with both the castle and the harbor. In 1648 the castle was beleaguered by Cromwell and taken after a siege of six weeks. The town dates from the early years of British history. It owns its water supply, slaughterhouses, and markets. Pop. (municipal borough, including Pembroke Dock), 1901, 15,853; 1911, 15,673.

PEMBROKE. A municipality of Leinster, Ireland, constituting a southeast suburb of Dublin. Pop., 1901, 25,799; 1911, 29,294.

PEMBROKE, pēm'brök. A town and the county seat of Renfrew County, Ontario, Canada, on the Ottawa River and on the Canadian Pacific and Grand Trunk railways, 105 miles by rail from Ottawa (Map: Ontario, H 2). The town possesses fine municipal buildings and two hospitals, and its industrial establishments include lumber, saw, shoo, steel, and woolen mills, a steel and equipment mill, and manufactories of builders' materials, machine-shop products, stoves, carriages, lumbering tools, leather, gloves, moocasins, incubators, and bricks. Pop., 1901, 5156; 1911, 5626.

PEMBROKE. A town in Merrimack Co., N. H., about 6 miles south of Concord, on the Merrimack River and on the Boston and Maine Railroad (Map: New Hampshire, F 7). It contains the Pembroke Academy, a sanitarium, and the Josie Langmaid and Soldiers monuments,

Farming, poultry raising, and the manufacture of cotton goods are the chief industries. Pop., 1900, 3183; 1910, 3062.

PEMBROKE, pēm'brūk, EARL OF. A title of the British family of Herbert (q.v.).

PEMBROKE COLLEGE. A college at Cambridge, England. It was founded by Mary de St. Paul, wife of Aymer de Valence, in 1347. It has always occupied an honorable place among Cambridge colleges and has had among its members some of the most distinguished men in England. Of these the greatest are Pitt, the poets Spenser and Gray, Archbishops Whitgift, Grindal, and Rotherham, the martyrs Ridley, Rogers, and Bradford. The college library, of some 20,000 volumes, is one of the most interesting and valuable college collections in Cambridge. There are 13 fellowships and 29 scholarships, and in 1913-14 there were 293 undergraduates.

PEMBROKE COLLEGE. A college at Oxford, England. It was founded by James I in 1624 and endowed by Thomas Tesdale, of Glympton, Oxfordshire, and Richard Wightwick, B.D., rector of Ilsey, Berks. It took its name from William, Earl of Pembroke, then chancellor of the university. Its buildings, though not large, are quite modern and very attractive. The college in 1913-14 had a master, 7 fellowships, several honorary fellows and lecturers, 32 scholars, and about 150 undergraduates in all. Never a large college, a number of distinguished men have been connected with it, especially in the seventeenth and eighteenth centuries. Among these may be mentioned Camden the antiquary, John Pym, Beaumont the dramatist, George Whitefield, Sir William Blackstone, Shenstone, Sir Thomas Browne, and Samuel Johnson. Consult Douglas Maclean, *Pembroke College* (London, 1900).

PEMBROKESHIRE, pēm'brūk-shēr. The westernmost county of Wales, bounded north and west by St. George's Channel, east by Cardigan and Carmarthen, south by the Bristol Channel (Map: Wales, B 5). Area, 614 square miles. The surface is undulating. The principal elevations are the Precelly Hills, which traverse the north of the county from east to west and attain a maximum altitude of 1754 feet. The chief river is the Leifi. The Eastern and Western Cleddan unite and form a navigable portion of Milford Haven. The north and west shores are indented with fine bays and dotted with islands; the estuary of Milford Haven forms one of the best harbors on the coast of Great Britain; the south shores are wild and rugged, fronted with precipitous cliffs. The climate is mild but damp. There are excellent and productive soils in the south, and along the northwest coast the barley districts are famous. Oats, barley, and potatoes are the principal crops. Coal, iron, zinc, and lead are mined and slate is quarried. Fine breeds of horses are raised. There are important fisheries. The chief towns are Pembroke (the capital), St. Davids, Tenby, Fishguard, and Haverfordwest. Pop., 1901, 88,732; 1911, 89,960.

PEMELL, RICHARD BICKERTON. See LYONS, R. B. PEMELL, LOED.

PEMMICAN (Cree Indian name). An Indian food preparation much used among all the tribes east of the Rocky Mountains except those in the extreme south, and consisting of lean dried meat of buffalo, deer, or, in modern days, beef, pounded to a powder and liberally mixed with boiling fat, which is poured over it. It is

then pressed into cakes and packed into par-fleche (rawhide) cases until needed. Berries are frequently pounded up and mixed with the meat. Pemican contains a great amount of nutriment in compact form, and when thus prepared will continue sweet and good for an indefinite time so long as it is kept dry. It is the staple commissary article of hunters, traders, and other travelers throughout the great Northwest, and especially of Arctic and Antarctic explorers.

PEMPHIGUS (Neo-Lat., from Gk. *πέμφιξ*, *pemphix*, bubble), or **POMPHOLYX**. A disease of the skin in which appear on its surface blebs or bullæ filled with serum, pus, or blood, with itching, fever, and great impairment of the general health. Similar blebs appear on the mucous membrane. The blebs burst after a time, leaving a rough, reddened surface, and scaling occurs in the variety termed *pemphigus foliaceus*. This variety is always chronic and an attack lasts from several months to several years, successive crops of bullæ appearing and rupturing. In *pemphigus vulgaris*, which may be acute or chronic, the vesicles contain clear serum at first. This variety may last but two or three weeks, but it may last for months or years and terminate fatally. A rare form, *pemphigus vegetans*, has been described by Neumann. In this form warty vegetations develop upon the denuded surfaces. In the treatment of this disease arsenic, strychnine, iron, and quinine are given internally, local applications of a sedative nature are made, and warm baths are given for months, the patients being suspended under water upon a hammock night and day.

PEN (OF., Fr. *penne*, from Lat. *penna*, pen, feather, OLat. *pesna*, feather; probably connected with Gk. *πτερόν*, *pteron*, OHG. *fedara*, Ger. *Feder*, AS. *feþar*, Eng. *feather*, Skt. *Patatra*, feather, from *pat*, to fly). An instrument for writing with a fluid ink. For many centuries the quill pen was the only kind used, and when metal was employed its forms were copied. Bronze pens were found in Pompeii, and Isidore of Seville, who died 636 A.D., mentions reeds and pens among the instruments employed in writing. A century and a half later Alcuin writes of the use of pens. Probably their general use began with the introduction of modern paper, and the use of the quill pen persisted until long after the middle of the nineteenth century.

Steel Pens. Towards the close of the eighteenth century various experiments were made towards the manufacture of steel pens. At first they were barrel-shaped and as much like a quill pen as possible, being made by bending a flat piece of steel into a tube and then filing it into shape, the joint of the two edges forming the slit. These pens were expensive and unsatisfactory, for they were hard and inflexible. In 1820 Joseph Gillott, of England, began the manufacture of steel pens and greatly improved their form. He also cheapened their price by introducing machinery for their manufacture. Presses were contrived for cutting, bending, and marking, and other machinery for cleaning and polishing. The manufacture of steel pens was not introduced into the United States until about 1860. By that time the art had been perfected and a knowledge of the varieties of steel best adapted for pens had been acquired. Most of the steel used in American factories is imported from England or Sweden. It is received by the manufacturer in sheets of varying thick-

ness and is prepared for conversion into pens by a preliminary process of annealing, polishing, and rolling. The last-named operation requires considerable care and skill, for the steel must be passed between successive rollers until reduced to a required thickness, which averages about 0.009 inch. The slightest variation in the thickness of the sheet affects the flexibility of the finished pen. The blanks, which are cut in screw presses, are next stamped or pressed into the desired shape, and then the small hole which terminates the slit in the finished pen and prevents it from spreading is punched. After another annealing the blanks are placed between a pair of dies which give them their curved form. Hardening by plunging into hot oil, cleaning in sand and sawdust, and tempering are the next processes. The polishing is performed by placing the pens in revolving barrels of sand or sawdust and then grinding against a revolving emery wheel. The tempering is done by placing the pens in an iron cylinder which is kept revolving over a charcoal fire until they are of the proper temper. This is a delicate process, regulated by the color shown by the pens, which indicates the temperature of the metal. The last and perhaps most important mechanical operation is slitting the pen point. This is done by a specially constructed shearing machine of great delicacy of construction. The pens are now subjected to a final burnishing, and possibly lacquering to prevent rust, and are ready for the market.

Gold Pens. Though steel pens are used in greater quantities than any other kind, there is an increasing demand for gold pens on account of their greater flexibility and durability and especially for their use in fountain pens, to which they are essential. Gold pens were first made in 1825 in England. In the United States their manufacture was first attempted by a watchmaker of Detroit in 1835. In 1840 the business was moved to New York, various improvements were introduced, and the manufacture grew in importance. At first the points of gold pens were protected by diamonds or rubies. The discovery that the native alloy of iridium and osmium could be used much more cheaply as well as satisfactorily was made by John Isaac Hawkins, an American residing in England. The American right to this discovery was purchased by a New York establishment. About 1850 it was discovered that by embedding the iridium points in the gold instead of soldering them on a stronger pen was produced. Gold pens are made in a manner similar to steel pens. The fine gold is alloyed with silver and copper in the proportion of 233½ parts of gold to 92 of silver and 76 of copper. The 14-carat metal in the form of blocks is rolled into thin sheets and the blanks are stamped and shaped with dies. The underside of the point is notched with a circular saw to receive the iridium tip, which is secured by a blowpipe. The slit is cut through the solid iridium by means of a thin copper wheel. The pen is now finished by grinding the points under a microscope, setting the nibs.

Fountain Pens. A fountain pen is one having an ink barrel in the holder which supplies ink as required by means of an automatic feed. Fountain pens were manufactured in England as early as 1835, but they did not attain any great degree of success. In the Schaeffer pen the ink was admitted to the pen from a reservoir in the holder by pressing a projecting

button with the thumb. In the Parker pen the flow of ink was regulated by a piston controlled by a rotating nut. Other early attempts sought to control the flow from the barrel by means of tubes, springs, valves, or other mechanical contrivances. In all these early attempts the flow of ink was found to be irregular. In 1884 a patent was granted to L. E. Waterman for an automatic underfeed pen where there is a groove in the surface of a small rubber bar with three fine slits at its bottom. Modern fountain pens are based on this principle. The flow of ink is usually regulated by a feed, and air is admitted to the barrel to take the place of the ink as it is used. A typical fountain pen consists of four pieces of hard rubber and a gold pen. The handle containing the ink reservoir is in two pieces, connected with a screw joint, so that it may readily be taken apart for filling. The gold pen is held in the point section of the barrel by means of a third piece of rubber, the feed bar, which also conveys the ink from the reservoir to the pen. Air is admitted to the barrel, to replace the ink as it is used, by means of a cavity in the feed connecting with the hole at the end of the slit in the back of the pen proper. During the act of writing the ink is drawn from the reservoir by capillary attraction, through the feed to the pen point, and the flow ceases with the writing. The fourth piece of rubber is the cap, which covers the pen to protect it from injury and keep the ink from drying when not in use. Self-filling fountain pens of various designs are now extensively used, as well as those with screw or other tight-fitting caps which render impossible leakage irrespective of the position in which the pen is carried. In the self-filling pen some form of piston or suction draws up the ink into the barrel from an ordinary inkwell without unscrewing the end carrying the pen. A fountain pen usually holds ink enough for 10 hours or more of continuous writing, or from 15,000 words up, according to the size of the barrel.

Stylographic Pens, like fountain pens, have a reservoir to hold the ink, but instead of an ordinary pen point they have a pencil-shaped point; the point is tubular and in it plays a needle which releases the ink when pressed on the paper. This form of pen is useful with carbon paper for manifolding.

Statistics. According to the Thirteenth United States Census there were in the United States, in 1909, 50 establishments devoted to the manufacture of fountain and stylographic pens, while 15 made gold pens and 5 made steel pens. The capital invested in establishments making fountain, stylographic, and gold pens is given as \$3,120,971, and the value of the annual product \$4,738,693. In 1913 one American company had an output of 2,500,000 pens, valued at between \$8,000,000 and \$10,000,000, of which over 300,000 were exported, and the entire annual production of the United States is estimated at between 7,000,000 and 8,000,000 pens. In the steel and other metallic pens industry in 1909 there were five establishments having a total capital of \$803,783, manufacturing a product valued at \$576,696. The United States is credited with an annual production of some 2,500,000 gross in the world's output of between ten and twelve million gross.

Consult: "Canter Lectures," in *Journal Royal Society of Arts* (London, 1905); also *The Twelfth Census*, vol. x, part iv (Washington, 1900),

where is published an article entitled "Pens and Pencils"; and for later statistical information *The Thirteenth Census*, vol. viii, "Manufactures" (ib., 1913).

PENA, pá'ná, CARLOS MARÍA DE (1852-). An Uruguayan public official and diplomat. He received the degree of doctor of law and social sciences in 1876 from the University of Montevideo, where later for many years (1885-1911) he was professor of political economy and administrative law and for several years dean of the School of Law and Social Sciences. In 1889-90 he was mayor of Montevideo. Afterward at various times he served as Secretary of the Treasury and as Minister of Public Works, Industry, and Public Instruction in the national government and in various other capacities at home; was special and confidential envoy to Brazil in 1907, a delegate to the Pan-American Conference at Buenos Aires in 1911, and after 1911 Uruguayan Minister to the United States. He is author of a number of volumes on the education, commerce, and industry of Uruguay.

PEÑAFORTE, RAYMOND OF. See RAYMOND OF PEÑAFORTE.

PENAL CODE. A systematic collection and arrangement of the laws of a state or country relating to crimes and their punishment embodied in a single legislative act. By this means the various wrongful acts and omissions which constitute crimes, the degrees of crime, and the penalty imposed for each are all defined and set forth in an orderly manner. Nearly all of the nations of Europe and several of the United States have thus embodied their criminal laws in the convenient and comparatively simple form of a penal code. Some States, including New York, have also adopted a code of criminal procedure which, as its name indicates, provides the mode of enforcing the law as set forth in the penal code. See CODE, and the authorities there referred to.

PENAL LAW. See CRIMINAL LAW.

PENAL TRANSPORTATION. See TRANSPORTATION, PENAL.

PEN'ALTY (Fr. *pénalité*, from ML. *pœnalitas*, punishment, from Lat. *pœnalis*, relating to punishment, from *pœna*, punishment, from Gk. *ποινή*, *poine*, fine, punishment; connected with *rivein*, *tinein*, Skt. *ci*, to avenge). In the most general sense, punishment of any kind for violations of law or legal duty, as the death penalty. Specifically, however, the term is in English and American law more commonly employed to denote a money payment required by law, as a punishment for an offense or for omission to comply with some statutory duty. In this sense a penalty is usually imposed for a violation of the law less serious in its nature than a crime. For example, a neglect to conform to sanitary regulations generally subjects the offender to payment of a sum of money imposed as a penalty, which is considered as commensurate with the gravity of the offense. A penalty differs but little from a fine in its nature and purposes. As penalties are commonly imposed for the less serious violations of the law, which are, for that reason, not so likely to come to the attention of the public authorities, the statutes creating them often provide, as an inducement to persons to inform on offenders, that the whole or a part of the penalty shall go to the informer. In some jurisdictions the informer may recover the amount of the penalty by civil action, and in others payment to the public officials is enforced

by the alternative of imprisonment, and the amount collected is then paid to the informer.

In the law of contracts the term "penalty" is applied to an arbitrary sum fixed by the parties to an agreement, to be paid by the one guilty of a breach thereof. As the civil (as distinguished from the criminal) law is averse to the infliction of forfeitures and penalties, this practice is no longer sanctioned, and a sum fixed as a penalty cannot be recovered by legal action. Where, however, a sum so agreed upon is based on a calculation as to the probable amount of damages in case of a breach, it will be considered as liquidated damages and not as a penalty, and payment enforced.

PEN'ANCE (OF. *penance, penance, penance*, from Lat. *pœnitentia*, repentance, from *pœnitere*, to repent, frequentative of *pœnire*, *pœnire*, to punish, from *pœna*, punishment). The voluntary or accepted punishment by which a repentant baptized sinner manifests his sorrow for sin and seeks to atone for the sin and to avert the punishment which, even after the guilt has been remitted, may still remain due to the offense. Roman Catholics number penance among the seven sacraments (q.v.), and believe it to be of direct divine institution. (Matt. xvi. 19, xviii. 18; John xx. 22, 23.) The matter of this sacrament consists, in their view, of the three acts of the penitent—contrition, or heartfelt sorrow for sin as being an offense against God; confession, or detailed accusation of one's self to a priest approved for the purpose; and satisfaction, or the acceptance and accomplishment of certain penitential works in atonement of the sin confessed; and the form of the sacrament is the sentence of absolution from sin pronounced by the priest who has received the confession and has been satisfied of the penitential disposition of the self-accusing sinner. Even in the apostolic times the practice prevailed of excluding persons of scandalous life from Christian fellowship (see EXCOMMUNICATION), and without attempting to fix the date, it may be stated as certain, from the authority of Tertullian (*De Pœnitentiâ*) and other writers, that from a very early time the persons so excluded were subjected to certain penitential regulations. The class of offenders so treated were those who had been notoriously guilty of the grievous crimes of idolatry or apostasy, murder, adultery, and other scandalous offenses. The period of penitential probation differed in different times and places, but in general was graduated according to the enormity of the sin, some going so far in their rigor (see NOVATION) as, contrary to the clearly expressed sense of the Church, to carry it even beyond the grave. The penitent, in ordinary cases, could only be restored to communion by the bishop who had excluded him, and this only at the expiration of the appointed time, unless the bishop himself had shortened it; but in case of dangerous illness he might be restored, with the condition, however, that if he recovered from the illness the whole course of penance should be completed. The reconciliation of penitents took place commonly in Holy Week, and was publicly performed by the bishop in the church, with prayer and imposition of hands. It was followed by the administration of communion. This public discipline continued in force with greater or less exactness in the fifth, sixth, and seventh centuries, gradually, however, being replaced by semipublic and ultimately by private penance.

In the eleventh and twelfth centuries the public penance had entirely disappeared. The nature and origin of private penance are subjects of controversy between Catholics and Protestants, the former contending that it had existed from the first and that it held the same place even in the ages of public penance for secret sins which the public penance did for public offenses. At all events, from the date of the cessation of the public discipline it has existed universally in the Roman Catholic church. The priest, in absolving the penitent, imposes upon him the obligation of reciting certain prayers, undergoing certain works of mortification, or performing certain devotional exercises. These acts of the penitent are held to form an integral part of the sacrament of penance.

Outside of what is explained above as sacramental penance, devout Roman Catholics have always believed in the infliction of voluntary mortifications as being pleasing to God, since they are based on an intense detestation of sin and realization of its enormity; and many of the saints have gone to almost incredible lengths in seeking suffering as a means of purifying the soul and uniting it more closely with God.

Luther fought stoutly against the doctrine of penance current in his day as being contrary to some of what he considered the most essential principles of scriptural Christianity, particularly to the doctrine of justification by faith in Jesus Christ alone, on the ground of his complete or finished work; penance being founded on a doctrine of at least supplementary atonement by the works or sufferings of man—the sinner—himself. His teaching has been generally followed by Protestants. The outward expressions of humiliation, sorrow, and repentance common under the Jewish dispensation are regarded as very consistent with the character of that dispensation, in which so many symbols were employed. It is also held that the self-inflicted austerities, as fasting, sackcloth and ashes, etc., of Jewish and earliest Christian times, had for their sole purpose the mortification of unholy lusts and sinful passions in the people of God, or the expression of sorrow for sin, so that others beholding might be warned of its evil and restrained from it. Accordingly, in the discipline of the Protestant churches penance is now unknown. The nearest approach to the Roman Catholic polity on the subject was that in use among the English Puritans of the seventeenth century, and more particularly in the Church of Scotland during that and the succeeding century, when it was common "to make satisfaction publicly on the stool of repentance"; but this was never considered as in any way a sacrament. Consult: J. Arndt, *True Christianity: A Treatise on Sincere Repentance* (Philadelphia, 1868); G. Gerhard, *Eucharistic und Bussakrament in den ersten sechs Jahrhunderten der Kirche* (Freiburg, 1908); T. W. Drury, *Repentance and Absolution* (New York, 1903). See ABSOLUTION; CONFESSION; INDULGENCE.

PEN-AND-INK FISH. See CALAMARY.

PENANG, pē-nāng' (Betel-Nut Island). The most northerly division of the British colony of the Straits Settlements. It consists of Penang Island (called also Prince of Wales Island), Province Wellesley, and the Dindings Territory, the total area being stated at 571 square miles. Penang Island, separated by a strait from 2 to 10 miles wide from the west coast of the Malay

Peninsula, is about 15 miles long and 9 miles broad, having an area of 108 square miles (Map: Burma, C 5); it is largely covered by jungle. The chief town is Georgetown (sometimes called Penang), in the northeastern part of Penang Island, in lat. 2° 10' N. and long. 100° 21' E. Next to Singapore, Georgetown is the chief port of the Straits Settlements; it has a capacious harbor and is defended by forts.

Province Wellesley is opposite the island, on the mainland, extending from the Muda River south 45 miles to a point 10 miles below the Krian River and embracing an area of 280 square miles. At the south it touches Perak, but otherwise its landward limits march with Kedah. The Dindings Territory comprises the island of Pangkor (crossed by the parallel 4° 15' N.), some smaller islands, and a strip of territory (bounded by Perak) on the opposite mainland, the total area being stated at about 183 square miles. The chief town of the Dindings is Lumut, on the mainland, which has a fine harbor with deep anchorage.

The climate is uniform. In 1913 the mean temperature in Penang was 82.2° and in Province Wellesley 81.9°. The rainfall in Penang in 1912 was 120 inches, in Province Wellesley 106 inches, and in the Dindings 73 inches. The principal produce for export comes from Province Wellesley and consists of tapioca, rice, rubber, and sugar. Penang is the chief centre for the trade of northern Sumatra and the Malay Peninsula. Its aggregate trade in 1913 (including inter-settlement trade) amounted to 271,041,222 Straits Settlements dollars (the Straits Settlements dollar = \$0.5677 United States money); the export of tin from Georgetown was valued at 57,070,228 dollars. A railway, 23 miles long, connects Prai, in Province Wellesley, with the Perak system. The population of the settlement of Penang was 235,618 in 1891, 248,207 in 1901, and 278,003 in 1911, mostly Malays and Chinese; estimate for 1914, 287,935 (Asiatics, 176,057 males, 108,735 females; Eurasians, 981 and 800; Europeans and Americans, 488 and 239). In 1901 the population of Penang Island was 128,830, and of Georgetown municipality 94,086; in 1911 Penang Island had 141,559 inhabitants, Province Wellesley 128,978, and the Dindings 7466.

Penang was the first British settlement in the Malay Peninsula. The island was ceded by the Rajah of Kedah to the East India Company in 1786. On account of the prevalence of piracy, in 1800 a strip of mainland coast was acquired, now (having been enlarged) known as Province Wellesley. Pangkor and smaller islands were ceded by Perak in 1826 (also to facilitate the suppression of piracy), and the mainland portion of the present Dindings Territory in 1874. In 1805 Penang was made a presidency of equal rank with Bombay and Madras. In 1826 Singapore and Malacca were incorporated with Penang; Georgetown continued as the seat of government until 1836, which in that year was transferred to Singapore. See STRAITS SETTLEMENTS.

PEN ARGYL, pên ār'jil. A borough in Northampton Co., Pa., 18 miles by rail north of Easton, on the Bangor and Portland and the Lehigh and New England railroads (Map: Pennsylvania, L 5). There are slate quarries and, among the industrial establishments, a shoe factory and a planing mill. Pop., 1900, 2784; 1910, 3967.

PENARTH, pên-arth'. A seaport and urban district of Glamorganshire, Wales, at the mouth of the Taff, opposite Cardiff (Map: Wales, C 5). It is a favorite seaside residence and bathing resort of the Cardiffians. It was an unimportant village until 1856, when its port was made a tidal harbor. It has a large dock covering 23 acres and is an important shipping port for the minerals of South Wales, especially coal, iron, and alabaster. The docks have 6125 feet of quayage and the tidal harbor 15,000 feet. The town maintains public baths, parks, and pleasure grounds and an isolation hospital. Pop., 1901, 14,200; 1911, 15,488.

PENATES, pē-nā'tēz (Lat. nom. pl., gods of the storeroom). The Roman gods of the storeroom, worshiped, with Vesta, at every hearth. The proper title is *di penates*, which indicates that a group of gods is here united under a comprehensive title, which is not really a proper name. It thus follows that the individual deities comprised in the title might vary in different families, and this seems proved by the variety of gods who appeared grouped with Lares and Genius as penates in the Pompeian paintings near the hearth. Vesta seems usually, if not always, included in these groups. Each family worshiped its own penates, though under the Empire the penates of the Imperial family were publicly honored. As the family had its private hearth, so the state had its temple of Vesta also, and with her were naturally worshiped the public penates, probably a collective title for the gods who cared for the prosperity of the state. Later (before 167 B.C., probably by some considerable time) a little temple of the penates was built on the Velia, a part of the Palatine Hill, towards the Forum, and now images after the type of the Greek Dioscuri were set up. Varro, it is true, denied that these were the true penates, whose sacred symbols were rather kept secretly in the *cellae Vestae*; but other antiquaries did not follow him, and much ingenuity was displayed in attempted explanation of these mysterious gods. They were identified with the great gods of Samothrace, and after the time of Augustus it was the orthodox belief that they had been brought from Troy to Italy by Aeneas. See LARES; MANES. Consult W. W. Fowler, *The Religious Experience of the Roman People* (London, 1911), and Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

PEN'CIL (OF. *pinzel*, Fr. *pinceau*, from Lat. *penicillum*, *penicillus*, painter's brush, dim. of *penis*, Gk. *πέος*, *peos*, tail, penis). An instrument for writing or drawing, employing some coloring material of which it is composed, as lead, graphite, or slate. Probably the pencil was the first instrument used by artists and in its earliest form consisted simply of a lump of colored earth or chalk cut into a form convenient to hold in the hand. With such pencils were executed the line drawings of Aridices, the Corinthian, and Telephanes, the Sicyonian, and also the early one-colored pictures or *monochromata* of the Greeks and Egyptians. The use of metallic lead for marking is of very ancient origin. Pliny refers to the use of lead for making lines on papyrus, and Cortés in 1520 found the Aztecs using lead crayons. Black-lead pencils are made of graphite or plumbago, which contains no lead whatever in its composition, but is in reality almost pure carbon. (See GRAPHITE.) The misnomer is probably owing to the

fact that, previous to the employment of graphite for making pencils, common lead was used, a material which, indeed, continued to be employed until well into the nineteenth century. Consequently, since plumbago with its black streak offered a contrast to the pale mark of the lead, it was called, in contradistinction, black lead.

Development of the Industry. The manufacture of graphite pencils in England began in 1564, when a valuable graphite mine was discovered at Barrowdale, Cumberland. The mine was so highly prized that Parliament kept it guarded with an armed force, and, to keep up the value of the product, it was worked only six weeks in the year. The early graphite pencils were made by pulverizing the graphite and compressing it into solid blocks by means of a hydraulic press, and then cutting bars from the blocks. In 1850 the Barrowdale mine became exhausted. Graphite is now mined at Passau, Bavaria; Schwarzbach, Bohemia; in Norway, in New Zealand, in Mexico, and in various parts of the United States. The mine containing the purest graphite yet discovered is located at Ticonderoga, in New York State. It yields a product which is 99.9 per cent pure carbon. (See GRAPHITE.) The manufacture of lead pencils is extensively carried on in Germany, England, and America.

Pencil Manufacture in the United States. The two raw materials essential for pencil manufacture, pure graphite and excellent cedar for the cases, exist in such generous quantities in the United States as to favor exceptionally the growth of this industry. The first manufacturer of black-lead pencils in the United States was William Monroe, of Concord, Mass., who in 1812 invented a process by which he pulverized and mixed the material and incased it in cedar holders. He was very successful in selling his product and continued the business for about 18 months, when he was obliged to give it up on account of the difficulty of obtaining the raw materials. Later he resumed the manufacture of pencils and continued it on a small scale for many years. Another pioneer in the industry was Joseph Dixon, and in 1860 the Fabers established a branch factory in the United States.

Method of Manufacture. The familiar lead pencil of everyday use consists of a round or polygonal stick of graphite mixed with clay, surrounded by a cedar case. The graphite is first reduced to an impalpable powder by grinding. Water is then added and the substance is run through mixers in a fluid state, the proper amount of finely powdered clay being put into the mixture and thoroughly blended with it. A little lampblack is sometimes added to the composition to increase the blackness. The more clay used, the harder will be the pencil. The mixing is performed by specially constructed machinery. After thorough mixing the mass is placed in filter presses to exclude the water and reduce the mixture to a doughy consistency. The material is next passed through dies consisting of successive plates with holes of varying diameter. Great pressure is used, causing the mixture to ooze forth in doughy strings. This process is repeated several times. The final dies are of the same diameter as the finished lead. The graphite in this form is straightened, cut into three-foot lengths, and allowed to dry. It is next cut into pieces of the required length, usually about 7 inches. These pieces are packed

in crucibles and burned for several hours, to extract the moisture. The graphite pieces, or leads, which range from 0.066 to 0.073 inch in diameter, are now ready to be inserted in the wooden cases. Sometimes the plumbago is calcined before being mixed with clay. For some varieties of drawing pencils the leads are immersed for a minute in very hot melted wax or suet before being mounted.

The leads are usually incased in the wood before it is shaped into a pencil. Little slabs of cedar, two, four, or six pencils wide, are passed through a machine which cuts out semicircular grooves the diameter of the pencil. Into the grooves in one of these slabs the leads are laid and another grooved slab is glued to it, thus completely incasing the graphite. The slabs are now passed through machines which divide them into pencils, with their sides shaped in hexagonal or in curved form. After the processes of polishing, varnishing, and stamping, all of which are performed by machinery, the pencils are ready for shipment.

Colored Pencils are made of chalk, clay, or wax, mixed with coloring pigments, the nature of which does not permit their being calcined like black pencils. They may be incased in wood like ordinary pencils, or simply wrapped in paper. A useful form of pencil is the so-called indelible ink or copying pencil where aniline coloring matter mixed with the graphite enables one to make a purplish line, which on being moistened takes a brighter color and may be transferred by ordinary copying methods. Towards the close of the nineteenth century a process was invented by which both black and colored pencils were incased in paper instead of wood. A sheet of paper cut for a part of its width into strips about $\frac{1}{4}$ inch wide is wrapped around the lead to form a case of the usual thickness. The surface is painted. When the pencil point wears down too close to the paper it is sharpened, that is, more lead is exposed, by simply unwinding one of the narrow strips of paper.

Slate Pencils are sometimes inclosed in wood, but are more often little unprotected rods of slate or some form of talc. Partly from sanitary reasons, they are not nearly so much used as formerly, paper and lead pencil having taken for most purposes the place of slate and pencil.

Statistics. According to the Thirteenth Census of the United States (volume on Manufactures, published 1914) there were, in 1909, 11 pencil factories, having a total capital of \$7,867,247, and producing an annual output valued at \$7,378,744. The number of factories reported has increased only three since the census of 1860, but the capital invested was then only \$6,600 and the value of the product about \$20,400. The value of the pencils and pencil leads imported into the United States for the census year 1909 was \$514,697, while in 1914 the imports were valued at \$642,998.

. Consult: L. L. White, "Production of Red Cedar for Pencil Wood," *United States Department of Agriculture, Forest Service Circular 102* (Washington, 1907); also *The Twelfth United States Census*, vol. x, part iv, "Manufactures," which contains historical, descriptive, and statistical matter regarding the pencil industry in the United States (Washington, 1900); while later statistical information on the industry will be found in the *Thirteenth Census of the United States*, vol. viii, "Manufacturers" (ib., 1913).

Consult also the publications of the United States Forestry Service, and various papers in the *American Lumberman* (Chicago, annually).

PENCIL, IN MATHEMATICS. See PERSPECTIVE.

PENCK, pēpk, ALBRECHT (1858-). A German geologist and physical geographer, born and educated at Leipzig (Ph.D., 1878). He made special studies of the mountains of Bavaria and Tirol (1880), and traveled in Europe, Asia, Africa, and America. After serving as docent at Munich he was in 1885 appointed professor of physical geography at Vienna. He was editor of *Geographische Abhandlungen* (1886 et seq.) and a contributor to the *Geological Journal* of Chicago. In 1892 he was appointed president of the central commission for the study of the geography of Germany, and in 1906 became professor of geography at the University at Berlin and director of the museum of oceanography. In 1909 he was exchange professor at Columbia University, New York City. He became a member of the International Polar Commission. Among his many works are: *Die Vergleichen der deutschen Alpen* (1882); *Die Eiszeit in den Pyrenäen* (1884); *Morphologie der Erdoberfläche* (1894); *Die Alpen im Eiszeitalter* (1901-08); he published many maps also.

PENCZ, pēnts, GEORG (c.1500-50). A German painter and engraver. He was born at Nuremberg and was probably a pupil of Dürer or, at least, stood immediately under his influence. He was received into the Painters' Guild in 1523, but in the year following was banished for religious reasons. About 1532 he returned to Nuremberg, where he was frequently employed by the city council. He is supposed to have visited Italy, where he was strongly influenced by the Italian masters and to have perfected himself in engraving under Marc Antonio. Although Pencz is credited as an assistant in the decorations of the Nuremberg Rathaus, his fame as a painter rests chiefly on his masterly portraits, which rank among the finest productions of the Nuremberg school. Especially characteristic are a "Young Man" (1534), "The Painter Erhard Schwetzer" (1544), and his "Wife" (1545), all in the Berlin Museum; a "Young Man" (1543), in the Vienna Museum; "Fieldmarshal Sebaldus Schirmer" (1545), in the Germanic Museum, Nuremberg; and a "Scholar" in the Karlsruhe Gallery. Pencz is most prominent as an engraver, ranking next to the Behans among the Little Masters. His style is clear, but is lacking in grace; his execution is solid and his tendency didactic. Besides his largest plate, "The Taking of Carthage" (1539), after Giulio Romano, may be mentioned the "Six Triumphs of Petrarch," "Life of Christ" (26 plates), "Medea," and the portrait of John Frederick, Elector of Saxony. Consult: W. B. Scott, *The Little Masters* (London, 1879); Albrecht Kurzwelly, *Forschungen zu Georg Pencz* (Leipzig, 1895); E. Waldmann, *Die Nürnberger Kleinmeister* (ib., 1910).

PEN'DA. A king of the Anglo-Saxon Kingdom of Mercia (q.v.).

PEN'DANT (Lat. *pendens*, hanging, pres. p. of *pendere*, to hang). A hanging ornament, used in ceilings, vaults, staircases, timber roofs, as the end of keystones, posts, corbels, etc. It is sometimes a simple ball and sometimes is elaborately ornamented, and used chiefly in the later Gothic and Renaissance styles.

PEND D'OREILLE, pēnd ô-rēl'. See KALISPEL.

PENDENNIS, THE HISTORY OF. A novel by W. M. Thackeray (1850). Arthur Pendennis, the hero, an amiable, commonplace, but thoroughly lifelike young man, becomes in ripper years a successful writer in London, and as such tells the story of *The Newcomes*.

PENDENTIVE. A structure of masonry designed for the support of a domical vault over four or more isolated piers. It may be described as a triangular portion of a spherical surface, bounded by two adjacent half arches and by that part of the base of the dome comprised between them. It is usually employed over four, more rarely over eight, piers or supports connected by arches. Its development by Byzantine architects of the sixth century made it possible to erect domes (see DOME) above interiors of any desired plan, and this made it one of the greatest acquisitions in the history of architecture. By extension, any device for supporting a dome over a polygon or a square is often called pendentive, as in the case of the Mohammedan stalactite pendentive; but it is an inaccurate use of the term to apply it to corbeling or squinches. See BYZANTINE ART.

PEN'DER, HAROLD (1879-). An American electrical engineer, born at Tarboro, N. C. He was educated at Johns Hopkins (A.B., 1898; Ph.D., 1901), was instructor at Syracuse University (1902-03), and spent the winter of 1903 at the Sorbonne. He served as electrical engineer of the Westinghouse Electric and Manufacturing Company (1903-04) and of the New York Central Railroad (1904-05), and then engaged in work in connection with Cary T. Hutchinson and with the McCall Ferry Power Company until 1909. At Massachusetts Institute of Technology he was professor of electrical engineering in 1909-13, and thereafter director of the research division of the institute's department of electrical engineering. Besides editing the *American Electrical Engineering Handbook* (1914), Pender is author of *Principles of Electrical Engineering* (1911).

PENDER, SIR JOHN (1816-96). A British cable pioneer, born in the Vale of Leven, Scotland. He established himself as a textile merchant of Glasgow and Manchester. In 1857 he became a director of the first Atlantic Cable Company; when this company failed he helped to found the Anglo-American Company in 1865; and the next year, when this company was succeeded by the Telegraph Construction and Maintenance Company, he became its chairman and personally guaranteed for it more than \$1,000,000. At the time of his death he possessed a controlling interest in cable companies with a joint capital of nearly \$75,000,000. Pender sat in Parliament in 1865-66, 1872-85, and 1892-96. He received the K.C.M.G. in 1888 and the G.C.M.G. four years later.

PENDLETON, pēn'd'l-ton. A town of Lancashire, England, suburban to Manchester on the northwest. Pendleton is part of the parliamentary borough of Salford and is incorporated with its municipality. It has a large race course. The rapid increase of its population is owing to the immense industries of the locality, which are identified with those of Salford and Manchester (q.v.) and are connected chiefly with cotton and silk manufactures. Pop. 1901, 75,000; 1911, 78,783.

PENDLETON. A town and the county seat

of Umatilla Co., Oreg., 225 miles east of Portland, located on the Umatilla River and on the line of the Oregon Railroad and Navigation Company and the Washington and Columbia River Railroad (Map: Oregon, G 2). Pendleton is the distributing centre of a very productive region interested largely in wheat growing and in the raising of cattle, hogs, sheep, and horses; it has flour mills, woolen and wool-scouring mills, machine shops, etc. Some of these establishments are operated by water power supplied by the river, which is here crossed by four substantial bridges. The chief buildings are a fine courthouse, a Carnegie library, high and grade schools, a State hospital for the insane, and a Federal building. The Pendleton "Roundup" is an annual frontier festival and exhibition which attracts thousands of visitors. Pop., 1900, 4406; 1910, 4460.

PENDLETON, EDMUND (1721-1803). An American statesman of the Revolutionary period. He was born in Caroline Co., Va., and was wholly self-educated. In 1744 he was admitted to the bar and in 1752 was elected to the House of Burgesses, of which he was a member for many years, serving several terms as Speaker. He was a member of the Committee of Correspondence in 1773; was a delegate to the First Continental Congress (1774); and was president of the Virginia conventions of 1775 and 1776. The resolution of May, 1776, instructing the State delegates to introduce a declaration of independence in Congress, was written by him. In 1776 he became president of the Committee of Safety, and, on the organization of the State government, was elected Speaker of the House of Burgesses and, somewhat later, president of the Court of Chancery. In 1777 he became crippled for life, but continued to serve as Speaker of the House, and in 1779 became president of the Court of Appeals, which position he held until his death. In 1788 he presided over the Virginia convention which ratified the Federal Constitution, he himself taking an active part in the debate and being largely responsible for the final decision.

PENDLETON, ELLEN FITZ (1864-). An American college president. She was born at Westerly, R. I., and was educated at Wellesley College (A.B., 1886; A.M., 1891) and at Newnham College, Cambridge (1889-90). At the former institution she served as tutor in mathematics (1886-88), instructor (1888-97), secretary (1897-1901), dean and associate professor of mathematics (1901-11), and thenceforth as president. Miss Pendleton received the honorary degree of Litt.D. from Brown University in 1911 and that of LL.D. from Mount Holyoke College in 1912.

PENDLETON, GEORGE HUNT (1825-89). An American lawyer, legislator, and civil-service reformer, born in Cincinnati, Ohio, July 25, 1825. He studied law, was admitted to the bar in Ohio, and became distinguished in his profession. He was a member of the State Senate in 1854-55, was elected to Congress in 1856, and served successively in the Thirty-fifth, Thirty-sixth, Thirty-seventh, and Thirty-eighth Congresses, being a member of the House Committee on Military Affairs during the first three terms and a member of the Ways and Means Committee during the last term. He identified himself with the Anti-War Democrats and attracted much public criticism on account of the boldness of his antagonism to the course of the

administration. In 1864 he was nominated for the vice-presidency of the United States on the ticket with General McClellan. As a candidate, however, he felt compelled to write an open letter avowing that he personally favored no terms of peace that would involve a final rupture. Pendleton was one of the most prominent leaders of the Greenback party, strongly opposing the payment of the government bonds in gold and the contraction of the currency. In 1879 he was elected to the United States Senate, where he won distinction as chairman of the Committee on Civil-Service Reform. Late in 1882 he introduced in the Senate the so-called Pendleton Bill for reforming the civil service. This bill passed the Senate on December 27 and the House on Jan. 5, 1883, and was approved by President Arthur on January 16. It marks the first definite establishment of the merit system as opposed to the spoils system in the United States. (See CIVIL-SERVICE REFORM.) At the expiration of his term as United States Senator, in 1885, he was appointed by President Cleveland Minister to Germany, which post he held until his death, at Brussels, Nov. 24, 1889.

PENDULUM (Neo-Lat. neut. sing. of Lat. *pendulus*, hanging down, from *pendere*, to hang). A pendulum is any rigid body mounted on a horizontal axis so that it can swing to and fro, making vibrations under the influence of gravity. A "simple" pendulum is the name given an imaginary pendulum consisting of a particle of matter suspended from a point by a cord supposed to be without mass. If the length of this cord is l and if g is the acceleration which the suspended particle would have if allowed to fall freely towards the earth, the period, or time taken for one complete vibration of the simple pendulum swinging in a vertical plane through very small arcs, is $2\pi \sqrt{\frac{l}{g}}$. The period of any actual or "compound" pendulum is given by the formula $2\pi \sqrt{\frac{I}{mgl}}$ where I is the moment of inertia of the pendulum about its axis of suspension, m is its mass, l is the distance from the centre of gravity to the axis, and g has its usual value. It is seen that the period of vibration of a pendulum is constant, being independent of the extent of the amplitude of vibration, provided only that it be small compared with l . This fact was made use of by Galileo, who also recognized the connection between the period and the length of a pendulum.

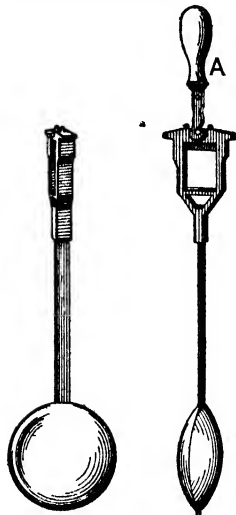
The length of the pendulum, as will be seen from the formula, varies as the square of the time of oscillation, and consequently a pendulum with a vibration period of one-half second has but one-quarter the length of a seconds pendulum. It is apparent also that pendulums of different kinds of matter, but in other respects identical, should have the same periods of vibration if g is the same for the different kinds of matter. This idea was tested by Newton and later by Bessel, who found that within experimental limits g is the same for all forms and kinds of matter. If g is different at different places on the earth, the fact will be shown by measuring the period of the same pendulum at these places. The variation of the force of gravity at different places on the earth's surface was first discovered by Richter in 1672.

The problem of deducing the length of a simple pendulum which should have the same period as a given compound pendulum was first solved

by Huygens. See CENTRE OF OSCILLATION; MECHANICS.

If the same pendulum is swung at various positions on the earth's surface, its time of vibration will vary, depending on the value of g . Accordingly one of the best methods of determining this quantity is to cause a pendulum to swing at different stations and carefully and exactly measure its time of oscillation. In the United States this work is done by the United States Coast and Geodetic Survey, and from their observations the value of the absolute force of gravity in the pendulum room of the Coast and Geodetic Survey at Washington has been found to be 980.112 dynes on the C.G.S. system. The relative measure between Washington and Potsdam, Germany, where an absolute determination has been made, gave this value, which was duly adopted.

The pendulums used in the United States Coast and Geodetic Survey for gravity determinations are about one-quarter of a meter long and swing with a period of one-half second in a case from which the air has been exhausted. The simple stem and a lenticular bob are of solid brass cast in one piece, the pendulum being supported on agate bearings. A beam of light is thrown into the pendulum case every second, and when the pendulum is vertical it is reflected into a telescope through the coincidence of two slits. A carefully rated chronometer, whose error is known to within a few hundredths of a second at the beginning and end of a series of observations, forms a part of



HALF-SECOND PENDULUM.

Front and side views of United States Coast and Geodetic Survey standard form. A, handle for lifting pendulum from the knife edges on which it is suspended.

the apparatus and enables the observer to determine with great accuracy the time of vibration of the pendulum. The chronometer is rated either from astronomical observations or by the noon signals sent from Washington over the commercial telegraph lines. The instruments of the Survey are extremely portable, and the observers travel from station to station making observations.

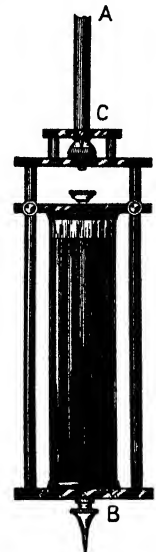
The intensity of the force of gravity is measured so that the probable error will not exceed one part in 200,000, and an actual error of this amount corresponds to an error of $\frac{1}{1000000}$ of a second in the time of oscillation of the pendulum. Numerous corrections are applied in making the observations, including allowance for the movement of the containing case, by means of the interferometer, such minute distances as the $\frac{1}{1000000}$ of an inch being readily measured. The variation in time of oscillation at three stations in North America, with considerable difference in their latitude, naturally is shown in the corresponding values of gravity. From such pendulum observations the observed

gravity in Washington is 980.112, at Key West, Fla., 978.970, and at Eagle City, Alaska, 982.183.

Another application of the pendulum, due to Foucault, is to show the rotation of the earth. Using a long pendulum with a heavy weight, he found that the plane of oscillation would shift in the same direction as the motion of the sun, or opposite to the rotation of the earth. Were the pendulum to vibrate at the pole, it would continue in the same plane as the earth rotated, the path of the pendulum appearing to make one complete revolution in 24 hours. At the equator, on the other hand, there would be no rotation of the plane of vibration.

In order to determine the length of a seconds pendulum at any particular place the method devised by Captain Kater of using a reversible pendulum is employed. Here the centre of oscillation and the centre of suspension are interchangeable, and the apparatus will be equivalent to a simple pendulum, whose length is the distance between them. In practice these two points are formed by knife edges, which can be moved with respect to each other along a rod, so that the vibrations of the pendulum will be synchronous irrespective of the knife edge by which it is supported. Such reversible pendulums were used for measuring the absolute value of gravity, a proceeding requiring the greatest care and a large number of observations.

Compensation Pendulum. As the length of a rod or bar of any material depends on its temperature (see HEAT), a clock with an ordinary or uncompensated pendulum goes faster in cold weather on account of contraction and slower in hot weather, due to expansion. In the method of correction usually employed, and called *compensation*, advantage is taken of the fact that different substances have different coefficients of linear expansion, so that if the bob of the pendulum is so suspended as to be raised by the expansion of one substance, and depressed by the expansion of another, the lengths of the effective portions of these substances may be so adjusted that the raising and depression, taking place simultaneously, may leave the position of the bob unaffected. There are two common methods of effecting this, differing a little in construction, but ultimately depending on the same principle. Of these, the *mercurial pendulum*, originally due to Graham, is the more easily described. The rod AC and the framework CB are of steel. Inside the framework is placed a cylindrical glass jar, nearly full of mercury, which can be raised or depressed by turning a screw. With an increase of temperature the steel portion AC is lengthened by an amount proportioned to its length, its coefficient of linear expansion, and the change of temperature conjointly, and thus the jar of mercury is removed from the axis of suspension. But neglecting the expansion of the glass, which is very small, the mercury rises in the jar by an



MERCURIAL COMPENSATING PENDULUM.

amount proportional to its bulk, its coefficient of cubical expansion, and the change of temperature conjointly. Now, by increasing or diminishing the quantity of mercury, it is obvious that we may so adjust the instrument that the length of the equivalent simple pendulum shall be unaltered by the change of temperature, whatever be its amount, so long as it is not great enough to change sensibly the coefficients of dilatation of the two metals.

The construction of the *gridiron* pendulum will be easily understood from the cut. The shaded bars are steel; the second and fourth ones are zinc, or some substance whose coefficient of linear expansion is considerably greater than that of steel. It is obvious from the figure that

the horizontal bars are merely connectors, and that their expansion has nothing to do with the vibration of the pendulum, so they may be made of any substance. It is easily seen that an increase of temperature lowers the bob by expanding the steel rods, whose effective length consists of the sum of the lengths of one of the outer rods and the steel bar to which the bob is attached; while it raises the bob by expanding the zinc bars, the effective length of which is that of one of them only; the other, as well as one of the outside steel rods, being added to the instrument for the sake of symmetry, strength, and stiffness only. If the effective lengths of steel and brass be inversely as their respective expansion coefficients, the position of the bob is unaltered by temperature; and therefore the pendulum will always vibrate in the same period. This is on the supposition that the weight of the framework may be neglected in comparison with that of the bob; if this weight must be taken into account, the requisite adjustments, though possible, are greatly more complex and can only be alluded to here. Instead of the *gridiron* arrangement it is possible to employ a centre rod of steel sur-

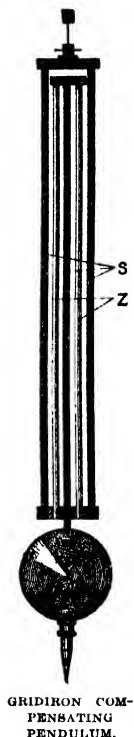
rounded by a tube of zinc and that in turn by a tube of steel with a lead bob, the combined lengths being as 34 for the steel to 14 for the zinc and lead. Practically it is found that a strip of dry fir wood, carefully varnished to prevent the absorption of moisture, and consequent hygrometric alterations of its length, is very little affected by change of temperature; and in many excellent clocks this is used with a lead or zinc bob as an effective substitute for the more elaborate forms just described.

In astronomical clocks, though they are kept at a temperature as nearly uniform as possible, the compensation of the pendulum is a matter of delicacy, and the calculations involved in their design so as to secure the proper amounts of materials are often most minute. Perhaps the most successful attempt to realize a compensating pendulum is found in the *Riefler* pendulum, a combination of the mercurial and metallic pendulums, which has found application for astronomical clocks and timekeepers of high precision, such as are found at national observa-

tories and in physical institutes like the United States Bureau of Standards. This pendulum consists of a steel tube of about 16 millimeters' bore and 1 millimeter thick, filled two-thirds of its length with mercury. It has a metal bob several kilograms in weight, so shaped as to cut the air, and below the bob are adjustable disk-shaped weights for correcting the compensation. This pendulum is said to be correct to ± 0.005 seconds a day with a $\pm 1^\circ$ variation in temperature. After the invention of *Invar* (q.v.) and its utilization, about 1900, it was found available for use as a pendulum rod on account of its very low coefficient of expansion. This use of the new nickel-steel alloy was investigated by its inventor, C. E. Guillaume, and it was demonstrated as a cheap and good arrangement available for many clocks of precision.

Bibliography. C. Wolf, *Bibliographie du pendule, 1629 to 1885* (Paris, 1889); W. L. Goodrich, *The Modern Clock* (Chicago, 1905); H. H. Cunyngame, *Time and Clocks* (London, 1906); A. Heckscher, "Historische Herleitung der Pendelgesetze," in *Archiv für die Geschichte der Naturwissenschaften und der Technik*, vol. v (Leipzig, 1914); F. J. Garrard, *Clock Repairing and Making* (London, 1914); also the *Journal Suisse d'Horlogerie* (Geneva); *Physical Review* (Ithaca); and most of the larger manuals on physics and mechanics. For the use of the one-half second pendulum in gravity determinations, consult: *United States Coast and Geodetic Survey, Annual Report, 1894*, Appendix 1 (Washington, 1895); G. R. Putnam, in *Coast and Geodetic Survey, Annual Report, 1901*, Appendix 5 (ib., 1902); W. H. Burger, "Method of Determining Flexure of the Pendulum Case by Use of an Interferometer," in *United States Coast and Geodetic Survey, Annual Report, 1910*, Appendix 6 (ib., 1911). The determination of the intensity of gravity throughout the United States will be found discussed in the same *Survey, Special Publications*, Nos. 10 and 12 for 1912, particularly in the latter, where is given a table of principal facts for 124 gravity stations in the United States, including the computed and observed gravity at each station. See MECHANICS.

PENELOPE, pē-nēl'ō-pē (Lat., from Gk. Πηνελόπη, *Pēnelopē*, Πηνελόπεια, *Pēnelopeia*). In Greek legend, a daughter of Icarios of Sparta and Peribœa and wife of Odysseus. According to the Homeric story Odysseus was soon called to the Trojan War, leaving his wife with their infant son Telemachus at Ithaca. When Troy had fallen and years passed without his return, numerous suitors gathered at his palace, whom the youthful Telemachus could not dispossess, though they devoured and wasted his father's goods, while importuning Penelope to choose one of them as her husband. For some time she put them off under the plea that she must first finish the shroud she was weaving for old Laertes, father of Odysseus. To protract the time, she raveled out at night what she wove by day. Betrayed by a maid, she was compelled to finish the work, and the suitors were preparing to force a decision, when Odysseus returned and slew them. Later epics told how Odysseus was subsequently slain in ignorance by Telegonus, his son by Circe, and how after his death Telemachus, Telegonus, and Penelope journeyed to Circe's island, where Telemachus wedded Circe, and Telegonus Penelope. There is considerable evidence connecting both Odysseus and



Penelope with Arcadia, as local divinities. At Mantinea the grave of Penelope was shown, and in Arcadian legends she is a nymph, who became by Hermes (or in another version by all the suitors) the mother of Pan. The later writers endeavored to account for her grave by saying that when Odysseus learned of her infidelity he dismissed her, whereupon she wandered to Lacedæmon and then to Mantinea, where she died.

PENEPLAIN, pē'né-plān'. See PLAIN.

PEN'ETAN'GUISHENE'. A town and summer resort in Simcoe Co., Ontario, Canada, on an inlet of Georgian Bay and on the Grand Trunk Railway (Map: Ontario, E 4). It has a Carnegie library, a hospital for the insane, and two parks. Its industries include the manufacture of leather, lumber, launch engines, boxes, carriages, foundry and machine-shop products, stoves, boats, canoes, fibre boards, shoe packs, sashes and doors, and bricks. Pop., 1901, 2422; 1911, 3568.

PEN'ETRA'TION OF A PROJECTILE.

See BALLISTICS.

PEN'FIELD, EDWARD (1866-). An American illustrator, designer, and painter. He was born in New York, where he studied at the Art Students' League, afterward working in Holland and England. He was associated with the Harpers, publishers, from 1891 until 1901, and designed many posters, magazine covers, and calendars for them as well as for various industrial concerns. He was one of the first in America to make poster designs in color, in which medium he showed himself to be an artist of originality and unusual force. His work is distinguished by simplicity, directness, and a wholesome humor, and, though unconventional, is without extravagance. His paintings include decorations in Randolph Hall, Cambridge, Mass., and in the Rochester Country Club. He is the author and illustrator of *Holland Sketches* (1907) and *Spanish Sketches* (1911).

PENFIELD, FREDERIC COURTLAND (1855-). An American diplomat, born in Connecticut. He was graduated from Russell's Military School at New Haven, Conn., studied in Germany, and engaged in journalism. In 1885 he received the appointment of Vice Consul General at London and in 1893-97 served as diplomatic agent and Consul General in Egypt. In 1913 President Wilson appointed him Ambassador to Austria-Hungary. He received various decorations from foreign governments, also the honorary degree of A.M. from Princeton in 1907. Both he and his wife, who established a hospital in Vienna, were active in relief work in behalf of Austrian soldiers during the European War. Besides frequent contributions to periodicals on diplomacy and international law, Penfield is author of *Present Day Egypt* (1899; rev. ed., 1903) and *East of Suez* (1907).

PENFIELD, SAMUEL LEWIS (1856-1906). An American mineralogist, born at Catskill, N. Y. He was graduated in 1877 at the Sheffield Scientific School of Yale and was appointed professor of mineralogy there. Penfield was elected to the National Academy of Sciences. His publications include: *Determinative Mineralogy and Blow-Pipe Analysis* (1898); *Tables of Minerals* (1903; 2d ed., 1907); and contributions to the *American Journal of Science and Art* on crystallography and mineralogy.

PENFIELD, WILLIAM LAWRENCE (1846-1909). An American jurist and international

lawyer, born at Dover, Mich. He was graduated at the University of Michigan in 1870, taught at Adrian College, and was admitted to the bar in 1872. The next year he settled at Auburn, Ind., was elected city attorney, and became prominent in Republican politics, in 1892 being a delegate to the Republican National Convention. From 1894 to 1897 he was judge of the circuit of Indiana. During the next eight years, while solicitor of the Department of State under appointment of Presidents McKinley and Roosevelt, Penfield came to be recognized as a foremost authority in international law. He was counsel for the United States in arbitrations between that country and Santo Domingo, Peru, Haiti, Nicaragua, Salvador, and Mexico, securing for the United States awards amounting to \$2,500,000. Also, in 1902, he represented the United States against Mexico in a case concerning the famous Pious Fund for the Californias, the first case tried before The Hague Tribunal. He was also counsel for both the United States and Venezuela in the preferential treatment case before The Hague Tribunal in 1903.

PENGE, pēnj. A municipality of Surrey, England, and a residential suburb of London, 7 miles southeast of St. Paul's. Pop., 1901, 22,460; 1911, 22,230.

PEN'GUIN (possibly from Welsh *pen gwen*, white head, applied to the auk and later transferred to the penguin, or perhaps from a native South American name). One of the Antarctic sea birds of the family Spheniscidae, representing the larger group Sphenisci. They have short wings, quite unfit for flight, but covered with short rigid scalelike feathers and much like the flippers of turtles. The legs are very short and are placed very far back, so that on land penguins rest on the tarsus, which is widened like the sole of the foot of a quadruped, and they thus maintain a perfectly erect posture. Their bones, unlike those of birds in general, are hard, compact, and heavy and have no air cavities; those of the extremities contain an oily marrow. The body is of an elliptical form; the neck of moderate length; the head small; the bill moderately long, straight, more or less compressed; the tail very short. They are among the most aquatic birds and spend little more time on shore than is necessary for sleeping and reproduction. Their food consists of the small creatures of the sea, which they catch by swimming and diving, often to great depths. The wings are modified internally as well as externally to make them effective aids in this work and are used together like oars, as other birds swim under water or fly in the air, so that continuous and rapid progress is made without the aid of the feet, which serve merely as rudders. Under their skin is a layer of blubber-like fat, which assists them to withstand the icy air and water of their habitat. They go about in swimming "schools" and gather at their breeding grounds in enormous flocks.

About 15 species are known, mainly in high southern latitudes, although some species straggle as far north as Peru and Brazil, New Zealand, and the Cape of Good Hope. It is upon the islands about Cape Horn and in the Antarctic Sea that they abound and breed in the greatest numbers. The life of the birds in these colonies is of the greatest interest, and their habits and interrelations are among the most remarkable to be found in ornithological history.

Some gather stones, bits of stick, grass, etc., into a sort of nest; others make no nest whatever; while the king penguin, and perhaps some others, incubate the egg by holding it between their thighs, resting on the top of their feet, the male and female relieving each other at intervals. A single egg only is laid, but it is tended and guarded with great care; and the mother penguin is said to keep her young one with her for a twelvemonth.

The king penguins (*Aptenodytes*) are the largest among the species. They stand 3 feet high and are grayish blue with black heads, white breasts, and orange or yellow throats. They exist in colonies of many thousands. The jackass penguins (*Spheniscus*) are medium-sized or small species with a stout bill. They receive their popular name from their cry. The rock hoppers or macaronis (*Eudyptes*) are notable for being curiously crested with curly yellow plumes on each side of the head. The smallest known species of penguin is *Eudyptula minor* of Australia and New Zealand, which is only about a foot long. In the Eocene rocks of New Zealand fossil remains of a giant penguin (*Palæudyptes antarcticus*) have been found, indicating a bird 6 or 7 feet high.

Bibliography. H. N. Mosely, *Notes by a Naturalist on Board the Challenger* (London, 1879); L. H. Stejneger, in *Standard Natural History*, vol. iv (Boston, 1885); Buller, *Birds of New Zealand* (2d ed., London, 1888); Alfred Newton, *Dictionary of Birds* (New York, 1893); Charles Darwin, *Voyage of a Naturalist* (new ed., New York, 1906); the writings of Antarctic navigators, especially F. B. Mildon, "The Emperor Penguin," in the *National Antarctic Expedition: Zoölogy*, ii (London, 1907); G. M. Levick, *Antarctic Penguins* (New York, 1914); R. C. Murphy, "The Penguins of South Georgia," in Museum of the Brooklyn Institute of Arts and Sciences, *Science Bulletin*, vol. ii, no. 5 (Brooklyn, N. Y., 1915), containing a bibliography. See Plate of AUKS, ALBATROSS, ETC.

PENHALLOW, pën-höl'lo, SAMUEL (1665-1726). An American colonist and historian, born at St. Mabon, Cornwall, England. He came to Massachusetts with the Rev. Charles Morton, his teacher, in 1686, lived for a time at Charlestown, Mass., and then removed to Portsmouth, N. H., where by marriage and business successes he acquired a considerable fortune and was successively made a magistrate, a member of the council, recorder of deeds, and justice of the Supreme Court of Judicature (1714), of which court he was Chief Justice from 1717 until his death. He was also for several years Treasurer of the Colony. He is remembered as the author of a *History of the Wars of New England with the Eastern Indians, or a Narrative of their Perfidy and Cruelty* (1726; reprinted in the *Collections of the New Hampshire Historical Society* in 1824 and separately at Cincinnati in 1859), which covers the period from 1703 to 1726, is the chief contemporary authority in English on Queen Anne's War and the so-called Lovewell's War, and has been of great value to historians.

PENICILLIUM (Lat. *penicillum*, *peniculus*, little tail or brush: cf. Lat. *peniculus*, small brush). The generic name of the common blue mold that develops on moist, stale bread and on other organic material. It belongs to the Ascomycetes (q.v.) and is characterized by the profusion of spore-bearing branches that arise

from the mycelium (q.v.), the terminal branches bearing rows of spores. It is a much used form in the laboratory, chiefly in experimental work in plant physiology.

PENIN'SULAR CAMPAIGN. The name given to the campaign of General McClellan, at the head of the Federal Army of the Potomac, against Richmond, Va., in April-July, 1862, during the Civil War. The campaign was so named because of McClellan's attempt to reach the Confederate capital by way of the peninsula formed by the York and the James rivers. For details, see CIVIL WAR IN AMERICA; GAINES'S MILL; MALVERN HILL; MCCLELLAN, G. B.; SEVEN DAYS' BATTLES; SEVEN PINES; WILLIAMSBURG; YORKTOWN.

PENINSULAR STATE. Florida. See STATES, POPULAR NAMES OF.

PENINSULAR WAR, THE. The struggle carried on in the Iberian Peninsula from 1807 to 1814 between the Emperor Napoleon on the one side and the Spaniards, the Portuguese, and the English on the other. After the Treaty of Tilsit Napoleon resolved to seize Portugal in order to enforce his Continental System (q.v.) against England. With the connivance of Spain a French army under Junot invaded Portugal and occupied Lisbon on Nov. 30, 1807. The flight of the royal family to Brazil left the Portuguese for the moment leaderless, but the English soon came to their assistance and, under the command of Sir Arthur Wellesley, afterward Duke of Wellington, defeated Junot at Vimero on Aug. 21, 1808, and by the Convention of Cintra, nine days later, forced him to evacuate Portugal. In the meantime the family affairs of Spanish royalty gave Napoleon a pretext for interfering in Spain. Armies under the direction of Murat occupied the country and on June 6, 1808, Joseph Bonaparte was proclaimed King of Spain. (See CHARLES IV; FERDINAND VII.) One of the divisions of the French army of occupation was trapped by the Spaniards and forced to surrender at Bailen (q.v.) on July 20, 1808. This disaster so startled Napoleon that immediately after the Congress of Erfurt he undertook in person a campaign in Spain with three large armies and occupied Madrid on Dec. 4, 1808. His army was lured away from Madrid by an English army under Sir John Moore, who invaded Spain from Portugal and then conducted a skillful retreat to Coruña. During the pursuit Napoleon turned over the command to Soult and hurried away to prepare for the campaign against Austria. While Napoleon's marshals were busy completing the conquest of the Peninsula, an English army under Wellesley landed at Lisbon on April 22, 1809. Having taken Oporto from Soult, Wellesley invaded Spain and fought a drawn battle with King Joseph and Marshal Victor at Talavera de la Reina on July 27-28. This battle saved Portugal from further harrying by the French, who, however, won a series of successes in Spain, including the victories of Almonacid on August 11 and Ocana on November 18. By the beginning of the summer of 1810 the French had subjugated practically the whole of Spain. The Province of Galicia and the fortified towns of Cadiz, Valencia, Badajoz, and Ciudad Rodrigo were the only important places still held by the Spaniards. During 1810 Napoleon hoped to take these places and to drive the English out of Portugal. With this purpose a large army under Masséna laid siege

to Ciudad Rodrigo, which was captured on July 19. Invading Portugal, Masséna captured Almeida on August 26 and, after a repulse by Wellington at Busaco on September 27, continued the pursuit of that general, who retired behind the well-fortified lines of Torres Vedras. The devastation of the country by the Portuguese, the incessant guerrilla warfare waged by the Spaniards, and the jealousies of the French marshals spoiled the plan of campaign. Soult captured Badajoz on March 11, 1811, but failed to cooperate with Masséna, who was forced to abandon the attempt to carry the lines of Torres Vedras in order to prevent the recapture of Almeida. Wellington defeated Masséna at Fuentes de Oñoro on May 5 and the English reoccupied Almeida. In January, 1812, Wellington took the offensive, captured Ciudad Rodrigo on January 19 and Badajoz on April 6, and defeated Marmont at Salamanca on July 22, but failed to capture Burgos and retired into winter quarters in Portugal. Elsewhere in Spain the French held their own until the withdrawal of troops from the Peninsula for the campaign of 1813 in Germany. The resumption of hostilities by Wellington forced King Joseph to abandon his capital and retreat towards the northern mountains. Wellington pushed the campaign with vigor, defeating Joseph and Jourdan at Vitoria on June 21, 1813, capturing San Sebastián on August 31 and invading France. Soult failed in successive attempts to check Wellington's victorious advance in southern France in the battles on the Nivelle, on the Nive, at Orthez on Feb. 27, 1814, and at Toulouse on April 10. Suchet succeeded in withdrawing his army from Aragon without loss and was marching to the assistance of Soult when the news of Napoleon's abdication arrived. The termination of the war at this moment enabled the English to transport many of Wellington's veterans to America to take part in the campaign of 1814 against the United States. Politically the invasion of the Peninsula was the most costly error in Napoleon's career, for there he first aroused that spirit of nationality which was destined to bring disaster on him not only in Spain but in Germany as well. From a military point of view the war in the Peninsula was a stupendous blunder for Napoleon, for it made a wanton increase in the number of his foes, it gave England her longed-for opportunity of fighting him on land, while its campaigns and its guerrilla warfare cost Napoleon thousands of men and proved demoralizing to the efficiency of his army. In his final campaigns he found himself with a formidable foe at his rear and was therefore unable to put in the field against his great continental enemies, Austria, Prussia, and Russia, the full military power of the French nation.

Bibliography. The best brief sketch is A. I. Shand, *The War in the Peninsula* (New York, 1898). The standard works are M. S. Foy, *Histoire de la guerre de la Péninsule sous Napoléon* (3d ed., 4 vols., Paris, 1828), and Sir W. F. P. Napier, *History of the War in the Peninsula* (new ed., 6 vols., London, 1850). The best works of recent scholarship are Gómez de Arteche y Moro, *Guerra de la independencia* (14 vols., Madrid, 1868-1903); Latino Coelho, *Historia política e militar desde os fins do 18 século ate 1814* (Lisbon, 1886); C. W. C. Oman, *History of the Peninsular War*, vols. i-v (New York, 1902-14). An extensive bibliography will

be found in *The Cambridge Modern History*, vol. ix (ib., 1906).

PENITENTIAL PSALMS. A name given to seven of the psalms as being specially expressive of sorrow for sin and accepted by Christian devotion as forms of prayer suitable for the repentant sinner. They are Psalms vi, xxxii, xxxviii, li, cii, cxxx, and cxliii, according to the Authorized Version, which correspond with vi, xxxi, xxxvii, l, ci, cxxix, and cxlii of the Vulgate. These psalms were set apart at a very early period, and the collection is referred to by Origen. Pope Innocent III ordered that they should be recited in Lent.

PENITENTIARY. A term commonly used as synonymous with prison (q.v.).

PENITENTIARY. In the history of the Roman Catholic church, a priest attached to cathedral churches, whose special duty it is to deal with difficult cases of the judgment to be passed on grave sins and the penance to be prescribed for them. The custom of appointing such officials is at least as old as the outbreak of the Novatianist schism; but the fourth Lateran Council, of 1215, prescribed their appointment for all metropolitan and cathedral churches, to represent the bishop in such matters when he was absent or otherwise hindered from giving his personal attention to the matter. Since the Council of Trent the office has normally been held by a member of the cathedral chapter, sometimes combined with that of vicar-general, and reserved cases are given into his hands. The cardinal penitentiary is an officer of the Roman curia who holds a corresponding position in regard to cases of absolution or dispensation such as are reserved to papal decision. He must be a priest and hold the degree of master in theology or doctor in canon law. He is assisted by an official theologian and canonist, and has a number of subordinates, who together make up the branch of the Roman administration called the *Penitentiaria*. A monthly session is held for the discussion of the more important cases, which are then, if necessary, referred directly to the Pope.

PÉNJAMO, pán'hà-mò. A town of Guanaajuato, Mexico, 50 miles southwest of the city of that name (Map: Mexico, H 7). Pop., 1900, 8262; 1910, 9328. The patriot Hidalgo was born on the neighboring hacienda of Corralejo, and here, in 1817, the filibuster Mina was shot.

PENJDEH, pènj'dà. An oasis in the southern part of Russian Turkestan, 25 miles from the boundary of Afghanistan (Map: Asia, Central, K 4). It belonged to the latter country until 1885; in that year it was the scene of the defeat of a body of Afghan troops by the Russians, which brought about strained relations between England and Russia. Pop., about 117,000.

PENKNIVES. See CUTLERY.

PEN'LEY, WILLIAM SYDNEY (1851-1912). An English actor, born at Broadstairs. His first success was as the curate in the comedy *The Private Secretary*, but he was best known for his part in Brandon Thomas's (q.v.) *Charley's Aunt* (1892), a farce that had a remarkably long run in both England and the United States.

PENMANSHIP. See HANDWRITING.

PENN, JOHN (1729-95). A proprietary lieutenant governor of Pennsylvania. He was born in London and was a grandson of William Penn. After a course in the University of Geneva he went to Pennsylvania, where, in 1753, he was appointed a member of the Provincial Council

He was a member of the Albany Congress of 1754, and in 1763 became Lieutenant Governor of Pennsylvania, which office he held until 1771, and then, after a visit to England, from 1773 to 1775. When the Revolutionary War broke out, although he attempted to maintain a neutral attitude, his authority was soon superseded by that of a revolutionary government, and in 1777 he was imprisoned, but after a few months was released. He received one-fourth of the £130,000 voted by the Legislature in compensation for the confiscated proprietary rights, and the same share of a £4000 annuity later granted the proprietors by the English government. Consult *The Pennsylvania Archives* and W. R. Shepherd, "Proprietary Government in Pennsylvania," in *Columbia University Studies in History, Economics, and Public Law*, vol. vi (New York, 1896).

PENN, JOHN (1741-88). An American patriot, one of the signers of the Declaration of Independence, born in Carolina Co., Va. He was admitted to the bar in 1762 and soon acquired a reputation as an eloquent and successful pleader. In 1774 he removed to Granville Co., N. C., and almost immediately became prominent there. Having espoused the Patriot cause, he was, in September, 1775, chosen a delegate to the Continental Congress, and next year signed the Declaration of Independence. He was rechosen delegate in 1777 and once again in 1779. In 1780, after the disastrous defeat of Camden, he virtually became dictator in North Carolina and did much to assist General Greene in his campaign against the invaders under Cornwallis. In 1784 he was appointed receiver of taxes for North Carolina by Robert Morris, but found his duties so disagreeable that he soon resigned.

PENN, RICHARD (c.1735-1811). A British Colonial Governor in America, born in England. He was a grandson of William Penn and was educated at St John's College, Cambridge. He began the study of law, but went to Pennsylvania in 1763, became a member of the Council in 1764, and remained, probably, until 1769. When his brother John, who was Lieutenant Governor, returned to England in 1771, Richard was sent out in his stead and served until August, 1773. He was very popular with both colonists and Indians. With Arthur Lee he carried the petition of the Congress to England. When examined before the House of Lords as to the ability and disposition of the colonists to resist the acts of Parliament, he was sharply reproved by the Ministers for his obvious sympathy with resistance. From 1784 until 1809 he represented various boroughs in Parliament.

PENN, THOMAS (1702-75). A British Colonial Proprietor, son of William Penn, the founder of Pennsylvania. He was born in Kensington and in 1718 succeeded to one-fourth of the proprietorship of Pennsylvania. In 1732 he went to Philadelphia. He held a power of attorney for his two brothers and assumed direction of the Colony until the arrival of his elder brother, John, in 1734. He remained in the Colony after his brother's return to England, presided at many of the Council meetings up to 1739, and held a great conference with the Indians in 1740. In 1747, upon the death of his elder brother, he inherited the latter's half interest and went to England to take charge. During the French and Indian War he sent £5000 for the relief of the Colony, having pre-

viously given money and land for the establishment of a public library in Philadelphia. When the dispute over taxation of the proprietary estates arose, he received Franklin, the agent of the Colony, who brought the Heads of Complaint in 1757, and he vigorously opposed the petition of the Colony, in 1764, that the crown should assume charge. His interest was finally purchased by the State.

PENN, SIR WILLIAM (1621-70). A British sailor, probably born in Bristol, England. He was brought up to follow the sea, and under the Commonwealth held many important naval commands. In 1649 he was appointed vice admiral of the Irish fleet, and in 1650-51 cruised along the coast of southern Europe and in the Mediterranean, seeking Prince Rupert. In 1652 he was appointed vice admiral of the fleet under Gen. Robert Blake (q.v.) and participated in the victory off Portland (Feb. 18, 1653) and those of June 3 and July 31. After the conclusion of the Dutch War Penn entered into negotiations with the Stuarts, but these proving fruitless, he accepted the command of a fleet sent against the Spanish possessions in America and on May 17, 1655, captured the island of Jamaica. In 1660 he was knighted by the King and was appointed a commissioner of the navy. Five years later he won, though nominally under the command of the Duke of York, a victory over the Dutch near Lowestoft (June 3, 1665). Consult Granville Penn, *Memorials of the Professional Life and Times of Sir William Penn* (2 vols., London, 1833).

PENN, WILLIAM (1644-1718). A celebrated English Quaker and the founder of Pennsylvania. He was the son of Sir William Penn, was born at Tower Hill, London, Oct. 14, 1644, and was educated chiefly at Christ Church, Oxford, where he became a Quaker. His enthusiasm for his new faith assumed a pugnacious form. Not only did he object to attending the services of the Church of England and to wearing the surplice of a student, both of which he considered papistical, but, along with some companions, who had also become Quakers, he attacked several of his fellow students and tore the obnoxious robes from their backs. For this conduct Penn was expelled from the university. His father was excessively annoyed at his conduct and, seeking a cure for his fanaticism, sent him to travel on the Continent, where he became a frequent guest at the court of Louis XIV. He returned to England in 1664, studied law at Lincoln's Inn for a year or more, and was then sent by his father to Ireland to look after his estates in the County of Cork. In the city of Cork, however, he fell in with Thomas Loe, and for attending a Quaker meeting was, along with some others, imprisoned by the mayor, though he was promptly released. He now became a minister and returned to England, where he and his father again quarreled because his conscience would not allow him to take off his hat to anybody, not even to the King, the Duke of York, or the admiral himself. Penn was for a second time turned out of doors by his father, but his mother smoothed matters so far that he was allowed to return home, and the admiral even exerted his influence with the government to wink at his son's attendance at the illegal conventicles of the Quakers, which nothing could induce him to give up. Meantime he was engaged in preaching and writing tracts on various religious subjects. In 1668, however, he was



WILLIAM PENN
AFTER THE PAINTING BY BENJAMIN WEST

thrown into the Tower, where he was confined for more than eight months on account of a publication entitled *The Sandy Foundation Shaken*, in which he attacked the ordinary doctrines of the Trinity. While in prison he wrote the most famous and most popular of his books, *No Cross, No Crown*, and *Innocency with her Open Face*, a vindication of himself which contributed to his liberation through the interference of the Duke of York. In September, 1670, Admiral Penn died, leaving his son an estate of £1500 a year, together with claims upon the crown for £16,000. In 1671 he was again committed to the Tower for preaching in violation of the Conventicle Act and, as he would take no oath at his trial, he was sent to Newgate for six months. Here he wrote four treatises, one of which, entitled *The Great Case of Liberty of Conscience*, is an admirable defense of the doctrine of toleration. After regaining his liberty he, together with Fox and Barclay, visited Holland and Germany for the advancement of Quaker interests. The Countess Palatine Elizabeth, the granddaughter of James I, showed him particular favor. On his return he again engaged in preaching and writing on religious topics, but circumstances soon turned his attention to the New World. In 1676 Penn and several associates founded a Quaker colony in West Jersey, which had come into their possession by purchase. In 1681 Penn obtained from the crown, in lieu of the £16,000 mentioned above, a grant of the territory from which the boundaries of the present State of Pennsylvania were determined. By a royal charter he was made Lord Proprietor of the territory of Pennsylvania. His great desire was to establish a home for his coreligionists in America, where they might preach and practice their convictions in unmolested peace. In the same year he sent out a governor to take possession of the province, and in the following year, 1682, with several friends, sailed for the Delaware, arriving in October. After taking formal possession he laid out a site for a new capital, which he named Philadelphia. Some time during the following year he had his famous interview with the Indians under the great elm at Shakumaxon (now Kensington) and concluded a treaty of lasting friendship with them. Penn's colony in its infancy escaped the horrors of Indian warfare which befell some of the other American settlements, and under the liberal though weak and confused government of its founder made immense progress during the next few years. Not only Quakers, but persecuted members of other religious sects, sought refuge in his new colony, where from the first the principle of toleration was established by law. Having called the colonists together, he gave the colony a constitution in 24 articles. Almost from the beginning Delaware, which was secured by a grant from the Duke of York, formed part of the Pennsylvania colony. In 1682 Penn and other Quakers bought East Jersey. Neither West Jersey nor East Jersey, however, remained permanently in the possession of the Quakers, the whole region being surrendered to the crown in 1702. Towards the end of the reign of Charles II, in 1684, Penn returned to England to exert himself in favor of his persecuted brethren at home, leaving behind a prosperous colony of 7000 inhabitants. His influence with James II, an old friend of his father, was so great that his exertions in favor of the Quakers

secured in 1686 a proclamation by which all persons imprisoned on account of their religious opinions were released, and more than 1200 Quakers were set free. In the April following, largely as a result of the same influence, James issued an edict for the repeal of all religious tests and penalties, but the mass of nonconformists distrusted his sincerity and refused to avail themselves of it. After the accession of the Prince of Orange as William III, Penn was twice accused of treason as a result of his relations with the exiled monarch, but was acquitted. In 1690 he was arrested on a charge of conspiracy, but was again acquitted for lack of evidence. Nevertheless in the following year the charge was renewed, and for a time he was deprived of the government of Pennsylvania. Nothing further appears to have been done for some time, but at last through the kindly offices of his friends, Locke, Tillotson, and others, the matter was thoroughly investigated, and he was finally and honorably acquitted, November, 1693, and restored to the government of his province. In 1699 he paid a second visit to the New World and found Pennsylvania in a prosperous condition. His stay, which lasted two years, was marked by many liberal measures and by efforts to ameliorate the condition both of the Indians and of the negroes. Penn departed for England towards the end of 1701, where by the treacherous manipulations of his steward, Ford, he was financially ruined. When Ford died he left to his widow and son false claims against his principal, and these were so ruthlessly pressed that Penn allowed himself to be thrown into Fleet Prison in 1708 to avoid extortion. His friends afterward procured his release, but not until his health had been fatally impaired. Later he was stricken with paralysis and in this condition lingered until his death, May 30, 1718. He was twice married and left issue by both marriages.

Bibliography. The works of Penn were published in 1782 in five volumes and again in 1825 in three volumes. His *Memoirs* were edited by Thomas Clarkson (2 vols., Philadelphia, 1813). Consult also: S. M. Janney, *Life of William Penn* (6th ed., ib., 1882); W. H. Dixon, *History of William Penn* (new ed., New York, 1903), refuting charges made by Lord Macaulay; S. G. Fisher, *The True William Penn* (Philadelphia, 1900); A. C. Buell, *William Penn as the Founder of Two Commonwealths* (ib., 1904); Mrs. Colquhoun Grant, *Quaker and Courtier: The Life and Work of William Penn* (ib., 1908).

PEN'NACOOK (nut place, or crooked place). A confederacy of Algonquian tribes formerly occupying the Merrimac River basin and adjacent region in New Hampshire, Massachusetts, and southern Maine. They occupied a middle ground between the southern New England tribes, with whom the English had dealing, and the Abnaki and others of the north, who were under French influence. Their early treaties were with the English, but their later alliances were with the French. The capital of the confederacy and the residence of the head chief, Passaconaway, was at Amoskeag, the present Manchester, N. H. Wamesit village, with Pawtucket Falls, was the great rendezvous during the fishing season. When first known to the English the Pennacook were estimated at 3000, which was probably below their real number, under the rule of the noted chief and medicine man, Passaconaway. He was friendly to the whites and invited the English to

settle upon the Merrimac. Before his death, about 1669, he saw almost his whole country in the hands of the whites and was himself obliged to petition for enough ground to live upon. In the meantime his people had been reduced by smallpox and other introduced diseases to about 1200. On the outbreak of King Philip's War in 1675 one or two of the Pennacook bands joined the hostile Indians, but the greater portion, under Wanalancet, the son of Passaconaway, remained on friendly terms with the English until, angered by the treacherous seizure of a number of their people, they abandoned their country and fled, part to the French in Canada, others to the Mohican on the Hudson. Those who removed to Canada were finally settled at St. Francis, Quebec Province.

PEN'NAMITE-YANKEE WAR. See WYOMING VALLEY.

PEN'NANT (variant of *pennon*, with excrement *t*, possibly associated by popular etymology with *pendant*, from OF., Fr. *pennon*, sort of flag, augmentative of OF. *penne*, from Lat. *penna*, feather, wing). A narrow flag or streamer tapering from the hoist to the fly or tip. In the signal codes pennants are two to five times as long as they are wide. The old commodores' broad pennant was a swallow-tail flag. The pennant of the senior officer present is blue and nearly equilateral. The narrow pennant worn by all vessels commissioned in the government service is carried at the main and signifies that she is a national ship. See Colored Plate of FLAGS OF THE UNITED STATES with UNITED STATES, and of INTERNATIONAL SIGNAL CODE with SIGNALS, MARINE.

PENNANT, THOMAS (1726-98). A British naturalist, born at Downing, near Holywell, in Flintshire, and educated at Queen's College, Oxford. In 1754 he visited Ireland, and about this time began those tours of the British Islands the published accounts of which contributed greatly to his reputation. In 1761 he began his *British Zoology*, the first part of which was published five years later. This work and his *History of Quadrupeds* (1781) were long held in the highest esteem by scientists. Among his other writings are: *Tours in Scotland* (3 vols., 1771-90); *Arctic Zoology* (1784-87); *Outlines of the Globe* (1798-1800); *Tours in Wales* (3 vols., 1778). Consult *The Literary Life of the Late Thomas Pennant, Esq., by Himself* (London, 1798), and W. T. Parkinson, *Memoir*, in Rhys's edition of the *Tours in Wales* (1883).

PENNANT'S MARTEN. See FISHER.

PENNANT-WINGED NIGHTJAR. A nightjar (*Macrodipteryx vexillarius*) of equatorial Africa, in which one of the quill feathers in each wing is greatly elongated and has a vane only near the end. The bird is rare and little known, but has been observed in the daytime seated upon the ground with the two modified wing feathers held perfectly erect, their feathery tips fluttering among the grass heads, from which they were scarcely to be distinguished. Cf. STANDARD-WING, and see Plate of NIGHTJARS.

PENN COLLEGE. A coeducational institution for higher education, founded at Oskaloosa, Iowa, in 1875 under the auspices of the Friends. The college comprises collegiate, preparatory, music, commercial, and normal courses, leading to the degrees of A.B., S.B., and Ph.B. There is an academy also, with the usual preparatory courses. The total enrollment in all departments in 1914-15 was 555, and the instructors

numbered 30. The college property is valued at \$300,000, the grounds and building at about \$200,000, and the endowment at \$274,000. The annual income amounts to about \$16,000. The library contains about 10,000 volumes. The president in 1915 was David Morton Edwards, Ph.D.

PENNELL, pen'el, JOSEPH (1860-). One of the foremost American etchers and lithographers, also a writer of note. He was born at Philadelphia, July 4, 1860, of Quaker parentage, was a pupil of the Pennsylvania Academy of Fine Arts and of the Pennsylvania School of Industrial Art, and studied etching with Stephen J. Ferris. In 1884 he went to Europe, where he chiefly lived thereafter, traveling in pursuit of his work or residing in London; however, he made several long stays in America. In London he was strongly influenced by his friend Whistler, but without losing originality. He is certainly the most widely known of all American graphic artists. He is represented by drawings, etchings, and lithographs in virtually all the European collections of graphic art, such as the Luxembourg (Paris), National Gallery (Berlin), the Uffizi (Florence), National Gallery (Rome), British Museum and Victoria and Albert Museum (London), Library of Congress (Washington), and the Brooklyn Museum. He became a member of the National Academy (1909), of the National Institute of Arts and Letters, and of most of the important European societies to which graphic artists belong. He received gold medals or grand prizes at Paris (1900), Chicago, Dresden, Milan, and St. Louis.

Pennell excels alike in etching and in lithography, in which mediums he has command of all technical means. His art is simple and direct. He displays a remarkable power of selection and grasp of the artistic possibilities of a subject, witness his early Philadelphia etchings and his later ones of New York and the Panama Canal. His subjects are both architectural and landscape, the figures being incidental. Among his principal works are: *A Canterbury Pilgrimage* (1885); *An Italian Pilgrimage* (1886); *Our Sentimental Journey through France and Italy* (1888); *Pen Drawing and Pen Draftsmen* (1889); *To Gypsy Land* (1893); *Modern Illustration* (1895); *Lithographs of New York* (1905); *Pictures of the Panama Canal* (1912); *The Glory of Greece* (1914); *Our Philadelphia* (1914). Among the books which he illustrated are: W. D. Howells, *Tuscan Cities* (1885); Washington Irving, *Alhambra* (1897); Mrs. Schuyler van Rensselaer, *English Cathedrals* (1902); Maurice Hewlett, *The Road in Tuscany* (1904); Henry James, *Italian Hours* and *A Little Tour in France*. His wife, ELIZABETH ROBINS PENNELL, furnished the text for many of his series, was joint author with him of *Lithography and Lithographers* (1900; new ed., 1915) and *The Authorized Life of J. McN. Whistler* (1910), and was sole author of a biography of her uncle, *Charles Godfrey Leland* (2 vols., 1906), known as Hans Breitmann in humorous literature.

PEN'NETHORNE, JOHN (1808-88). An English architect and antiquary, born at Worcester. He became a favorite pupil of John Nash (q.v.) and after 1830 spent five years on the Continent in the study of architecture. He was the first to announce the discovery of the

curved lines and other optical refinements in the Parthenon and the Temple of Medinet Abu. His theories were set forth in the pamphlet, *The Elements and Mathematical Principles of the Greek Architects and Artists, Recovered by an Analysis and Study of the Remaining Works of Architecture Designed and Erected in the Age of Pericles* (1844). Pennethorne is also author of *The Geometry and Optics of Ancient Architecture; Illustrated by Examples from Thebes, Athens, and Rome* (1878).

PENNI, pĕn'ē, GIANFRANCESCO, called IL FATTORE (c.1488-c.1528). An Italian painter, born in Florence. He was one of the favorite pupils and a friend of Raphael, and with Giulio Romano was his legatee and artistic executor. He painted from Raphael's designs in the Farnesina, and the Loggie and the Sala di Costantino in the Vatican, and made an excellent copy of the "Entombment" (now in the Turin Gallery), besides assisting his master in various other commissions. His original work is of little importance.

PEN'NINE ALPS. See ALPS.

PENNINE CHAIN. A range of hills in northern England. See UNITED KINGDOM.

PENNSYLVANIA {from *Penn* + Neo-Lat. *sylvania*, woodland, from Lat. *sylvanus*, *sylvanus*, relating to a forest, from *silva*, *sylva*, wood forest; named in honor of William Penn). A North Atlantic State of the United States, situated at the apex of the arch formed by the coast States from North Carolina to New England, whence it is popularly called the Keystone State. It lies between lat. 39° 43' and 42° 15' N. and between long. 74° 43' and 80° 31' W. It is bounded on the north by Lake Erie and New York, on the east by New York and New Jersey, on the south by a small part of Delaware and by Maryland and West Virginia, and on the west by West Virginia and Ohio. In shape it forms a rectangle. The north and south boundaries are straight lines running along parallels 157¼ miles apart, except for the small projection of the northwestern corner. The west boundary is a straight line running along the meridian, but the east boundary is formed by the Delaware River, which forms two large and regular zigzag bends, making the extreme length of the State 302 miles. The area is 45,126 square miles, of which 44,832 square miles are land surface. Pennsylvania ranks thirty-second in size among the States of the United States.

Topography. Three of the great physiographic belts which form the eastern United States are recognized in this State, running across its territory from southwest to northeast. The Atlantic coastal plain merely touches the southeast corner, and the first great physiographic belt is the piedmont plateau or plain (q.v.), which occupies the southeast portion between the lower course of the Delaware River and the Blue or Kittatinny Mountain Range. It has a width of about 60 miles and rises, by gentle undulations from ocean level at the Delaware estuary, to an elevation of 500 feet at the base of the mountains. It is broken, however, by several low ridges in the southeast and farther inland by the interrupted chain of semi-isolated groups of hills known as the South Mountain, which farther north becomes the Highlands of New Jersey and New York. The second belt is the Appalachian valley. This great physiographic feature extends from New

York to Alabama and Georgia and embraces the valley of eastern Tennessee and Virginia. In Pennsylvania it includes the Cumberland valley in the south and the Lebanon valley in the east. On the east and southeast this structural belt is defined by the Blue Ridge and Kittatinny ranges and on the northwest by the Alleghany plateau. The valleys, running in a general northeast-southwest direction, are occupied by streams, which have occasionally succeeded in cutting their way through the bounding mountain chain into an adjoining valley. Nearly all of this great belt lying in Pennsylvania is drained by the Susquehanna River. Towards the west it merges into the next physiographic belt, the change being more abrupt towards the southwest than farther northward. The highest portion of the State is in this belt, and the culminating point is Blue Knob, in Blair County, 3136 feet above ocean level. The third physiographic belt is the Alleghany plateau, the northern portion of the great Appalachian plateau which stretches from Tennessee to New York. This division covers the western half of the State at an elevation of 1000 to 2000 feet, sloping gently from the northeast towards the southwest. At an earlier geological period this plateau was a vast peneplain, but owing to revived stream action, caused by an elevation towards the northeast, the whole has been deeply carved and is intersected by a complicated valley system incised into the one-time plain, often to a depth of 500 or even 800 feet. Preceding the glacial period this portion of the State drained into the basin now occupied by Lake Erie, but the elevation of the land to the northward and the incoming of the ice, with its enormous deposits of glacial debris, reversed the direction of flow and established drainage as we now find it. The line of 1000 feet elevation is only 2 to 5 miles from the shore of Lake Erie, so there is here no lake-shore plain.

Hydrography. The three chief river systems are, in the order of their drainage areas, the Susquehanna, the Ohio, and the Delaware. These together drain over 90 per cent of the State. An insignificant area in the south belongs to the Potomac system and one in the north to the Genesee, while the extreme northwest corner is drained by short streams flowing into Lake Erie. The Delaware, which is navigable for the largest ships to Philadelphia and for small steamers some distance above, drains the east slope through its right tributaries, chief of which are the Lehigh and the Schuylkill. The Susquehanna crosses the State in a large zigzag from north to south, cutting through the various mountain ranges in narrow gaps, receiving its two main tributaries, the West Branch and the Juniata, from the west. It is broad, but shallow and unnavigable. The western part of the State is drained by the Ohio and its two great head streams, the Allegheny and Monongahela. The Allegheny is navigable for boats of light draft for a long distance, and the Monongahela, through its system of dams and locks, far into West Virginia.

Climate. The climate in the southeastern part along the Delaware is much warmer, both in summer and in winter, than in the western upland. The mean temperature for January at Philadelphia is 32.3° F. and for July 76.2° F. The corresponding figures for Wilkes-Barre, among the mountains, are 27° F. and 72° F.; for Pittsburgh, 31° F. and 75° F.;

and for Erie, on the lake shore, 27° F. and 70° F. The summer heat south of the Blue Mountain has been as high as 107° F. and is prolonged far into autumn. Northwest of the mountains the snow sometimes lies several feet deep throughout the winter, and the temperature may fall to 28° below zero. The average annual rainfall for the State is 44.6 inches. It is evenly distributed both as to season and through the larger regions of the State, though it may range from 35 to 50 inches in isolated localities.

Soil and Vegetation. The soils are on the whole somewhat more fertile than those of the average Atlantic State, there being no Tertiary sand area and comparatively small areas of primary rocks.

The soil is to a large extent decomposed limestone material, which is a good grain soil and, where least fertile, is well suited for pasturage.

Pennsylvania was originally one of the most densely forested States, but little virgin forest now remains.

Geology. The geological section in Pennsylvania includes rocks of all ages, from the Triassic down to the igneous and metamorphic (Archean) rocks found in the southeast. The lowest rocks geologically are in the southeast corner, and they become progressively later in age as one passes westward. In addition to the consolidated rocks large areas in the northeast and northwest are covered with glacial materials, and along the south-flowing streams are great terraces, the materials of which have been derived from glacial action. The piedmont plateau and the Appalachian Mountains consist of igneous rocks (granite, gneiss, diabase, and allied rocks) which have solidified from a molten magma and of sedimentary rocks which have been altered into slates, quartzites, or schists by metamorphic action. These are but part of the great belt of igneous and metamorphic rocks which extends along the eastern flank of the Appalachian Mountain system, and in Pennsylvania they have a general width of about 60 miles. In Pennsylvania this formation is split into two portions by a band of Triassic rocks, mainly red sandstone, which reaches in an irregular belt from the Delaware River southwesterly to the Maryland line. This area of Triassic rocks, as also the adjoining areas of igneous and metamorphic rocks, is cut by many intrusions of later age, largely trap dikes. The area of older rocks northwest of the Triassic belt has been formed into the South Mountain Range. West and northwest of this, rocks of Paleozoic age occupy the rest of the State. In the Appalachian valley division the rocks consist almost entirely of limestone, shale, and sandstone. When formed these were deposited horizontally, but we now find them lying at almost every angle of slope. It is therefore the edges of the several formations which outcrop, and they are found in long narrow irregular lines, roughly parallel. The more easily eroded and soluble rocks form the valleys and the more resistant ones the mountain chains, and therefore the valleys are largely of limestone. West of the Appalachian valley division the rocks become more and more horizontal, so that in much of the northwest and west portions the folding is very slight and has not been sufficient to control the lines of drainage. The outcrops of the older Paleozoic rocks, Cambrian, Ordovician, Silurian, and Devonian in age, lie roughly

parallel, the lower members abutting on the South Mountain chain. This area of older Paleozoic rocks is an extension of the same formations in south New York and in New Jersey. Following the time of the deposition of the rocks of Carboniferous age, this region was profoundly folded. The great expanse of Paleozoic sediments in the Ohio valley and adjacent regions formed a great buttress against which an almost irresistible horizontal thrust from the southeast forced the mass of sediments now found in the Appalachian valley. In addition to the belt of these older Paleozoic rocks now forming the mountains, there is a broad expanse of rocks of Devonian age along the north, extending westward to the Ohio State line. In the folding of the rocks along the mountain system there were left in the bottom of some of the deeper folds rocks of a later age, the true Carboniferous, constituting what we know as the anthracite coal region and the Broad-Top coal field of Huntingdon, Bedford, and Fulton counties. The presence of these rocks shows that the conditions which were favorable for the deposition of the formations of that age in the western portion of the State also existed over the now mountain region and determines the age of the folding as later than the deposition of the Carboniferous. These coals have been affected by the pressure and heat produced by the folding, the same as the other rocks of the series, and the character of the coal has been changed to anthracite in the more northern basins, while in the Broad-Top field, where metamorphic action is less pronounced, the coal can only be classed as semibituminous.

Mineral Resources. In addition to the coals before mentioned the western portion is entirely formed, south of the strip of Devonian rocks along the northern border, of rocks of Carboniferous age. These have been divided into several well-recognized series, most of which are coal bearing. The most noted of these coal beds is the Pittsburgh, which has been called the "most valuable mineral deposit on the face of the earth." There is annually mined from this bed in Pennsylvania about 100,000,000 tons. In the east portion there are valuable deposits of slate, graphite, iron ores, with smaller quantities of zinc, copper, soapstone, nickel, marble, other building stones, and limestone. In the west portion of the State, underlying in the main the rocks of Carboniferous age and mainly found in the Devonian rocks, are large quantities of petroleum and natural gas.

Mining. In 1913 the value of the products of the mines, excluding all duplications and derived products (coke, pig iron, etc.), was \$506,466,759, or 24.7 per cent of the total for the United States, and greater than the combined output of West Virginia, Ohio, Illinois, and California, the four States next in value of production. The output of anthracite coal in that year was 81,718,680 long tons, valued at \$195,181,127, while the output of bituminous coal reached the total of 173,781,217 short tons, valued at \$193,039,806. The value of the total coal production, more than \$388,000,000, was greater than that in any foreign country except Great Britain and Germany. Anthracite coal is now used almost exclusively as a domestic fuel, and it is probable that its output will not greatly increase over what it is at present. The output of bituminous coal, on the contrary, has regularly doubled each decade,

and it will undoubtedly continue to increase. The effect of the enormous output is being felt in several fields. The futurity under existing conditions of the great Pittsburgh bed will be less than 50 years. Portions of this bed constitute the famous Connellsville coking region, where the standard coke of the United States is made. The output of coke in Pennsylvania in 1913 was 28,753,444 short tons, valued at \$67,929,864. This value is not included in the State total heretofore given. The portion of coke made in by-product ovens is increasing, but the old-style beehive oven is almost exclusively used in the Connellsville and adjoining coke regions. While it is evident that Pennsylvania owes its unique position as a mineral producer to its coal, yet the State leads in the value of the mineral output other than coal, exceeding California by over \$15,000,000. There was produced, in 1913, 28,060,495 barrels of cement, the mineral second in importance; the output was valued at \$24,268,800. The Lehigh district, including the counties of Northampton, Carbon, Lehigh, and Berks in Pennsylvania and Warren County in New Jersey, the most important cement-producing region in the world, makes nearly one-third of the cement produced in the United States. Closely following cement come the clay products, the value of which was \$24,231,482. Pennsylvania ranks second among the States in total value of such products. The State ranks first in the output of brick and tile. The most important single clay product, as measured by value of output, is fire brick, the production being over one-third of the total output in the United States. All classes of brick and tile and terra cotta are made in Pennsylvania. In the production of natural gas Pennsylvania is second only to West Virginia. The value of output of this mineral was \$21,695,845. Pennsylvania ranks fifth in value of output of petroleum. In 1913 there were produced 7,963,282 barrels, valued at \$19,805,452. The State ranks first also in the production of stone, in output of slate, in the yield of sand and gravel, and in the production of lime. The value of the output of each for 1913 was as follows: stone, \$10,117,469; lime, \$2,743,197; slate, \$3,733,581; sand and gravel, \$3,381,692. Sixty per cent of the slate produced in the United States comes from Pennsylvania. The other products include copper, feldspar, glass sand, graphite, iron ore, metallic paints and mortar colors, mineral waters, ochre and sandlime brick. Pig iron to the value of \$197,726,314, and ferro-alloys to the value of \$10,939,453, both produced in the State in 1913, were not included in the total mineral output for that year.

Agriculture. Of an approximate land area of 28,692,480 acres, 18,586,832 acres were in farms in 1910, and the improved land in farms totaled 12,673,519 acres. The average Pennsylvania farm was 84.8 acres in size, and the average value per acre was \$56.01. The total number of farms in that year was 219,295. The total value of all farm property, including land and buildings, implements and machinery, and domestic animals, poultry, and bees, was \$1,253,274,862. Of the total number of farms, 168,190 were operated by owners and managers and 51,105 by tenants. There were 204,917 native white farmers and 13,832 foreign-born white, while 546 were negroes or other non-white. Of the foreign-born white 5048 came from Germany.

The following table gives the acreage, production, and value of the principal crops in 1914. The figures are estimates of the United States Department of Agriculture.

CROPS	Acreage	Prod. in bu.	Value
Hay .. .	3,141,000	*4,020,000	\$58,290,000
Corn .. .	1,463,000	62,178,000	45,390,000
Wheat .. .	1,312,000	23,747,000	24,687,000
Oats .. .	1,073,000	32,190,000	16,417,000
Rye .. .	280,000	5,040,000	4,183,000
Buckwheat .. .	280,000	5,740,000	4,362,000
Potatoes .. .	268,000	28,140,000	16,321,000
Tobacco .. .	33,100	†7,995,000	4,080,000

* Tons.

† Pounds.

The combined acreage under crops in 1910 was 7,826,562. Some 42.2 per cent of the total value of all crops was contributed by the cereals, 27.4 per cent by hay and forage, and 13.2 per cent by potatoes and other vegetables. In 1909 hay and forage covered 3,088,105 acres, from which were harvested 3,677,307 tons, valued at \$45,623,573. In the same year corn had an acreage of 1,380,671 and yielded 41,494,237 bushels, which were valued at \$27,330,860. Wheat, the next crop in importance, showed an acreage of 1,225,558, a production amounting to 21,564,479 bushels, with a value of \$22,920,638. Oats had an acreage of 1,144,248, a production of 28,172,686 bushels, with a value of \$14,421,972. Next in rank came potatoes, with an acreage of 262,013, a production of 21,740,611 bushels, valued at \$11,973,483. There were 41,742 acres in tobacco, of which 46,164,800 pounds were harvested. The total value of this crop was \$3,926,116. Buckwheat had an acreage of 292,728, from which 4,797,350 bushels were harvested; the production was valued at \$2,895,958. The total acreage of potatoes and other vegetables in 1910 was 357,430 and their value \$22,092,197. Excluding potatoes, the acreage of vegetables was 94,111 and their value \$10,014,000. Some 4860 acres were devoted in that year to flowers, plants, and nursery products, the output being valued at \$4,725,987. The most important of the small fruits is the strawberry, to which in 1909 there were devoted 4136 acres, and of which there were produced 9,033,904 quarts, valued at \$759,154. There was also a considerable production of raspberries, blackberries, and dewberries. In 1909 there were grown 13,286,000 bushels of orchard fruits, valued at \$8,678,000. Apples contributed about five-sixths of this value, peaches most of the remainder. In the same year 34,020,000 pounds of grapes, valued at \$851,000, and 3,796,000 pounds of nuts, valued at \$90,000, were grown.

Live Stock and Dairy Products. The total value of all live stock on farms in 1910 was \$133,327,286. According to the estimates of the United States Department of Agriculture there were on Jan. 1, 1915, on the farms: horses, 596,000, valued at \$79,864,000; mules, 46,000, valued at \$6,532,000; milch cows, 943,000, valued at \$56,108,000; cattle other than milch cows, 638,000, valued at \$18,693,000; sheep, 831,000, valued at \$4,404,000; swine, 1,186,000, valued at \$16,011,000.

Forest Products. In 1909 Pennsylvania ranked fourteenth in value of forest products. There were produced in that year by 3054 saw mills 1,462,771 M feet B. M. of rough lumber, 143,059 thousand lath, and 79,336 thousand

shingles. The soft woods, chiefly hemlock, white pine, and spruce, formed 56.1 per cent of the total lumber produced. Oak is by far the most important of the hard woods. Large quantities of chestnut, maple, beech, birch, hickory, yellow poplar, basswood, and ash are also cut. In 1913 there were reported 1159 active mills. The

contributed to make the State second in manufacturing only to New York, which position it has held since 1859. The value of manufactured products per capita in 1909 was \$343. The following table gives the most important figures relative to leading manufactures for 1904 and 1909.

COMPARATIVE SUMMARY FOR 1909 AND 1904

THE STATE — THE LEADING INDUSTRIES

INDUSTRY	Cen- sus	Number of estab- lish- ments	PERSONS ENGAGED IN INDUSTRY		Capital	Wages	Value of products	Value added by manu- facture
			Total	Wage earners (average number)				
All industries	1909	27,563	1,002,171	877,543	\$2,749,006	\$455,627	\$2,626,742	\$1,044,182
	1904	23,495	855,392	763,282	1,995,837	367,961	1,955,551	812,008
Boots and shoes, including cut stock findings.	1909	140	11,829	10,822	11,661	4,266	20,219	8,155
	1904	*133	9,685	8,990	7,394	3,263	14,884	5,977
Bread and other bakery products .	1909	3,185	17,838	12,221	30,888	6,528	45,850	18,520
	1904	2,817	15,011	10,964	19,100	5,392	33,370	14,070
Carpets and rugs, other than rag	1909	93	12,078	11,510	24,721	5,169	24,879	10,231
	1904	102	14,356	13,716	22,284	5,829	27,120	10,414
Cars and general shop construction and repairs by steam-railroad companies	1909	132	50,545	46,645	45,341	30,157	70,035	34,634
	1904	128	44,109	41,838	30,418	25,517	61,021	28,660
Cars, steam-railroad, not including operations of railroad companies.	1909	13	8,799	7,766	31,282	4,819	27,510	8,508
	1904	9	6,007	5,461	31,524	3,061	19,428	5,607
Clothing, men's, including shirts.	1909	696	26,405	23,623	20,790	8,992	39,682	19,819
	1904	451	19,570	17,574	16,644	5,853	31,714	15,097
Clothing, women's	1909	401	18,080	15,701	12,255	7,140	32,837	14,681
	1904	223	9,879	8,690	5,992	3,427	15,086	7,183
Coke	1909	146	16,219	15,331	68,023	8,436	51,816	18,054
	1904	110	10,975	10,154	56,839	5,173	28,924	13,945
Cotton goods, including cotton small wares.	1909	175	17,346	16,293	33,692	7,034	33,917	15,160
	1904	165	16,099	15,263	27,174	5,943	26,300	11,978
Electrical machinery, apparatus, and supplies.	1909	84	14,641	11,025	59,974	6,237	31,351	17,816
	1904	80	12,206	9,404	58,393	5,300	26,258	14,893
Flour-mill and gristmill products	1909	1,450	4,696	2,432	21,277	1,188	44,783	6,613
	1904	1,195	4,496	2,632	18,766	1,247	38,519	5,314
Foundry and machine-shop prod-ucts.	1909	1,695	100,505	86,821	283,556	51,366	210,746	109,735
	1904	1,415	85,974	75,581	216,023	40,604	153,393	84,357
Glass	1909	112	24,924	23,710	58,632	13,436	32,818	20,184
	1904	122	21,993	20,794	40,612	12,518	27,672	18,347
Hosiery and knit goods . .	1909	464	40,248	38,206	38,989	11,750	49,658	22,440
	1904	377	30,054	28,171	23,933	7,961	30,812	14,774
Iron and steel, blast furnaces	1909	66	16,215	14,521	194,708	9,457	168,578	26,504
	1904	65	14,782	13,867	107,742	7,764	107,455	21,133
Iron and steel, steel works and roll-ing mills.	1909	189	137,433	126,911	522,898	85,113	500,344	171,331
	1904	186	119,082	110,904	355,592	65,306	363,774	125,899
Leather, tanned, curried, and fin-ished.	1909	163	14,970	14,008	80,989	6,801	77,926	18,813
	1904	205	15,383	14,413	72,972	6,418	69,428	14,016
Liquors, malt	1909	237	9,007	7,234	94,135	5,453	47,713	35,103
	1904	225	7,076	5,864	68,884	4,072	34,864	25,587
Lumber and timber products....	1909	2,667	32,073	26,873	54,638	13,558	57,454	30,140
	1904	1,866	31,262	27,140	44,336	13,520	56,713	32,427
Paper and wood pulp	1909	62	7,196	6,656	27,747	3,303	19,873	8,475
	1904	65	6,283	5,906	21,469	2,839	15,411	6,901
Petroleum, refining	1909	41	3,423	2,900	38,990	1,861	63,088	5,648
	1904	43	4,657	4,227	32,847	2,371	47,460	8,538
Printing and publishing	1909	2,461	36,783	24,696	71,453	14,335	70,584	47,831
	1904	2,162	31,079	22,328	51,094	12,093	55,063	38,989
Silk and silk goods, including throwsters.	1909	226	38,178	36,469	49,679	11,443	62,001	26,895
	1904	168	28,240	26,915	31,312	6,973	39,334	15,067
Slaughtering and meat packing ..	1909	180	3,957	3,050	13,504	1,987	51,851	7,006
	1904	177	3,074	2,528	8,338	1,518	33,101	4,761
Tin plate and terneplate ...	1909	17	2,548	2,346	5,520	1,339	25,234	2,336
	1904	19	2,613	2,421	4,692	1,207	19,342	1,752
Tobacco manufactures	1909	2,432	37,580	33,188	27,604	11,620	50,161	29,448
	1904	2,808	35,265	30,748	23,371	10,438	40,897	24,960
Woolen, worsted, and felt goods, and wool hats.	1909	217	28,692	27,429	75,170	10,947	77,447	22,813
	1904	232	25,367	24,251	45,193	8,791	55,934	18,687

* Excluding statistics for two establishments, to avoid disclosure of individual operations.

781,547 M feet B. M. of lumber sawed in that year placed the State nineteenth in total number sawed. In addition to that mentioned above there were produced on the farms of the State forest products valued at \$7,986,599. Maple sugar and sirup to the combined value of \$471,213 were also produced.

Manufactures. The abundance, variety, and importance of Pennsylvania's natural resources and its accessibility to sources of raw material and to markets for its finished products have

Pennsylvania has a great variety of manufacturing activities. Of the 264 classifications used in the compilation of the Statistics of Manufactures by the United States Census Bureau in 1909, 245 were recorded for Pennsylvania. It easily outranked all other States in 1909 in the value of products of its steel works and rolling mills and in the manufacture of tinplate and terneplate. These represented 50.8 per cent, 43.1 per cent, and 52.6 per cent respectively of the entire output of the United

States for each of the industries. The manufacture of iron dates back to 1692, and the first successful works were established in Berks County in 1716. Pennsylvania holds its position as the leading State in the manufacture of iron and steel since 1756. The total production of steel in 1909 was 12,189,953 tons, of which 23.4 per cent was Bessemer and 76.1 per cent open-hearth steel. The production of rails was 848,924 tons, valued at \$24,077,184; structural shapes, 1,597,946 tons, valued at \$49,512,361; bars and rods, 1,749,220 tons, valued at \$56,717,882. In 1909 the number of blast-furnace stacks was 145, with a daily capacity of 41,707 tons. The total value of products was \$168,578,413, of which \$167,588,407 was pig iron. The iron ore charged into these furnaces amounted to 20,822,023 tons and the fuel consumed 12,095,186 tons. In 1913 the State Department of Labor and Industry reported 2309 establishments engaged in the manufacture of metal and metal products. The capital invested was \$859,540,000 and the value of products \$1,159,067,800. The number of employees was reported as 473,176. The textile industry ranks second in value of products, Pennsylvania holding second place in the Union in this regard. In 1909 there were 1,971,907 producing spindles, of which 1,017,992 were employed in the manufacture of silk and silk goods. The looms numbered 63,038, the silk mills using 26,249. The value of the products of the combined textile industry was \$267,840,579. The manufacture of woolen, worsted, and felt goods was the leading branch of this industry in value of products. In 1913, 918 establishments were reported for the manufacture of textiles. The capital invested was \$149,233,500 and the value of products \$231,142,000. The total number of employees was 116,324, of which 47,556 were males. Pennsylvania ranked first (1909) in the value of products of the leather industry, the manufacture of coke, glass, and railway cars, second in petroleum refining, tobacco manufacturing, and in the production of malt liquors, third in the manufacture of clothing; and sixth in lumber and forest products.

Of the total number of wage earners in 1909 the males numbered 693,894 and the females 183,649. The wage earners under 16 years of age numbered 29,107, of whom 15,044 were females. By far the larger number of females and wage earners under 16 years were employed in the textile industries. The prevailing hours of labor in 1909 were between 54 and 60 per week, only about 12 per cent of the wage earners working less than 54 hours. In 1909 there were 63 places which had populations of 10,000 or over. These contributed 63.3 per cent of the total value of manufactured products and contained 62.9 per cent of the wage earners. Philadelphia is the largest and most important city of the State and third in population in the United States. In 1909 it contained 251,884 wage earners, and it manufactured products valued at \$746,075,659, ranking third among the cities of the country. The city leads all others in the production of all textiles, the combined value of the products of which was \$146,135,000, more than double that of its nearest competitor. The leading industries and the value of their products in 1909 were the manufacture of woolen and worsted goods, \$54,922,000, printing and publishing, \$45,807,000; foundries and machine shops, \$38,685,000, and the manufacture of

women's clothing, \$30,133,000. As compared with the State as a whole, Philadelphia manufactured, in 1909, 28.4 per cent of the products as judged by value and employed 28.7 per cent of the total wage earners.

Pittsburgh ranks second in value of products and population. In 1909 it ranked seventh among the cities of the United States. The value of products in that year was \$243,453,693 and the number of wage earners employed 67,474. Iron and steel are the most important products, the value of which in 1909 was \$82,307,000. The combined value of the output of the industries using ore and metal as principal materials was more than 50 per cent of the total value of manufactured products of the city. Other important industries are slaughtering and meat packing, printing and publishing, and railway-car construction. Reading ranked third, with products valued at \$51,134,967 in 1909. The number of wage earners employed was 24,145. The steel works and rolling mills are the most important industry. The value of their products in 1909 was \$8,170,000, and they gave employment to 3011 wage earners. Other important industrial establishments are steam-railroad repair shops, hosiery knitting mills, foundries and machine shops, factories of boots and shoes, confectionery, fur-felt hats, iron and steel pipe, etc. Reading is one of the most important manufacturing centres for fur-felt hats, its production in 1909 amounting to 30.9 per cent of the total value for the United States. Other important cities in order of rank are Johnstown, McKeesport, New Castle, South Bethlehem, Scranton, Allentown, Erie, Harrisburg, Chester, York, Altoona, Lancaster, Wilkes-Barre, and Williamsport. For detailed information regarding these cities, see under their separate titles.

Transportation. Lake Erie on the west, Delaware Bay on the east, and many miles of navigable streams afford Pennsylvania almost unsurpassed water connection with markets in all parts of the country, besides affording outlets for foreign trade. Numerous canals form connecting links where natural waterways fail. The State ranks third in mileage of railroads among the States. The total mileage of main track, branches, and spurs was 12,331 on June 30, 1913. The most important railroads with their total mileage were the Pennsylvania, 3239; the Philadelphia and Reading, 963, the Lehigh Valley, 657, the Baltimore and Ohio, 656; the New York Central and Hudson River, 643; the Erie, 576, the Buffalo, Rochester, and Pittsburgh, 385, the Northern Central (Pennsylvania System), 283, the Delaware, Lackawanna, and Western, 261; the Central of New Jersey, 237; the Lake Shore and Michigan Southern (New York Central System), 233; the Buffalo and Susquehanna, 232, the Pittsburgh and Lake Erie (New York Central System), 210.

Banks. The Bank of North America, originally chartered by Congress in 1781, was the first bank in Pennsylvania, where it obtained a charter in 1782. In 1793 the Bank of Pennsylvania was incorporated as the official agent of the State, which was heavily interested in it. A few other banks were chartered by individual acts of the Legislature. In 1814 there were six banks, and the State owned stock in the most important ones. In 1814 the State policy towards the banking business underwent a radical change. The Commonwealth was divided

into 27 banking districts, each of which was allotted a definite number of banks. Unincorporated banking was prohibited and a comprehensive banking law passed. This could not avert the injurious results of the speculative inflation, and in 1816 many banks had to suspend specie payments. Banking became the object of popular disfavor and was held responsible for the critical times. A law was passed in 1819 providing for forfeiture of charter in case of suspension of specie payments, and it somewhat reduced the number of banks. The period of extensive internal improvements that followed stimulated the

any other class of banking organizations. Trust companies are conducted mostly in conjunction with the banks and take care of business which the law prohibits the banks from doing. The first savings bank in Pennsylvania was chartered in 1819. Previous to the Civil War there were 14 of them. A general law for their regulation, strictly limiting their avenues for investment, was passed in 1889. A clearing house was established in Philadelphia in 1858, or five years later than the one in New York. The condition of the banks in 1914 is shown as follows:

	National banks	State banks	Trust companies	Private banks	Mutual savings banks
Number	837	172	285	16	12
Capital.....	\$120,141,000	\$17,541,000	\$99,964,000	\$449,000	
Surplus.....	134,212,000	20,056,000	134,096,000	485,000	\$17,948,000
Cash, etc.....	94,131,000	6,461,000	27,368,000	138,000	2,609,000
Deposits.....	803,637,000	175,463,000	525,083,000	3,332,000	218,844,000
Loans.....	743,915,000	112,706,000	403,073,000	2,649,000	36,412,000

There were 500,465 depositors in the savings banks.

banking business as well as all other business of the State, and for 10 years the banks were exceptionally prosperous. In 1836 the second United States Bank, at the expiration of its national charter, became a Pennsylvania State institution, paying heavily for the privilege. The crisis of 1837 again caused a suspension of specie payment, and in 1840 after a hard struggle the United States Bank failed, ruined by its heavy investments in the State improvements and its heavy contributions to the State treasury. This failure, together with financial difficulties of the State treasury between 1840 and 1845, was felt by the other banks, and the stocks of most of them were sold far below par. Efforts were made to correct this by special legislation, by the levying of a tax on banking stock below par, and by making specie payments obligatory; but this last provision was frequently suspended by necessity. A slight improvement between 1850 and 1855 was followed by the severe crisis of 1857, when several Pennsylvania banks failed and a general suspension followed.

An agitation for a free banking system, with guaranteed circulation, was started, and in 1860 a free banking act was passed which was very similar to the New York Banking Law of 1837, but before the value of this act could be tested the national banking system came into existence. There was a marked demand for the national charters, which were supposed to exempt the banks from State taxation. By 1868 only 12 State banks remained as against 198 national banks. In 1870-73 more than 90 State banks were chartered by special acts, but the constitution of 1874 prohibited the organization of banks, except under the general law. In 1895 the State banking laws were thoroughly revised and a system established by which all banks, trust companies, mutual savings associations, building associations, and other organizations of this character, except the national banks, were subject to supervision of the Banking Department, its executive officer having power to examine into the condition of the banks of the State, require reports at intervals, and see that they comply with the law. National banks have a larger capital and much larger deposits than

Government. The present constitution was adopted on Dec. 16, 1873, and went into effect Jan. 1, 1874; there have been few important amendments. Amendments may be proposed in the Senate or House of Representatives, but in order to become effective must be adopted by a majority of both Houses of two successive legislatures and finally by the electors. If two or more amendments are submitted, they are voted upon separately.

Legislative.—The legislative power of the Commonwealth is vested in a General Assembly, consisting of a Senate and a House of Representatives. Members are chosen at the general election every second year. Senators are elected for a term of four and Representatives for a term of two years. One-half of the Senators are elected every second year. Senators must be 25 years and Representatives at least 21 years of age. They must have been citizens and inhabitants of the State for four years and inhabitants of their districts one year next preceding their election. The State is divided into 50 senatorial districts, each of which is entitled to one Senator. Representatives are apportioned among the counties in accordance with a prescribed ratio. The Legislature convenes on the first Tuesday in January in odd-numbered years.

Executive.—The executive department consists of a Governor, Lieutenant Governor, Secretary of the Commonwealth, Attorney-General, Auditor General, State Treasurer, Secretary of Internal Affairs, and Superintendent of Public Instruction. The Governor, the Secretary of Internal Affairs, the Auditor General, and State Treasurer hold office for four years and with the exception of the Secretary of Internal Affairs are not eligible to reelection for the next succeeding term. The Governor appoints, with the advice and consent of two-thirds of the Senate, the Secretary of the Commonwealth, the Attorney-General, and the Superintendent of Public Instruction.

Judiciary.—The judicial power is vested in a supreme court, a superior court, courts of common pleas, courts of oyer and terminer and general jail delivery, courts of quarter sessions of the peace, orphans' courts, and magistrates'

courts. The supreme and superior courts consist of seven judges. The supreme court judges are elected for a term of 21 years. One of these is the Chief Justice. The supreme and superior courts are the appellate courts. Each county containing 40,000 inhabitants constitutes a separate judicial district and elects one or more judges for that district. In the County of Philadelphia judicial jurisdiction and powers are vested in five distinct and separate courts of equal and coördinate jurisdiction. These are composed of three judges each. The courts of the several counties are designated courts of common pleas. All judges except the judges of the supreme court are elected for a period of 10 years.

Suffrage and Elections.—Every male citizen 21 years of age who has been a citizen of the United States one month and has resided in the State one year and in the election district two months is entitled to vote. If 22 years of age and upward, he must have paid within two years a State or county tax. General elections are held biennially on the Tuesday following the first Monday of November in even-numbered years. All elections for the several judicial districts and for county, city, ward, borough, and township offices are held on municipal election day, the Tuesday next following the first Monday of November in odd-numbered years. All candidates of political parties for all elective offices except that of presidential electors are nominated at primary elections. Provision is made for a preferential vote for president in the primaries. Provision is made for the personal registration of electors and their enrollment as members of political parties in cities of the first, second, and third classes. Enrollment is also required in all boroughs and townships. All elected officers of cities of the second class and judges of the courts of record are nominated and elected by nonpartisan ballots. Severe penalties are provided for crimes against the electorate. Expenditures of candidates are restricted. A proposed amendment to the constitution providing for universal suffrage was rejected in 1915 by an adverse majority of about 60,000.

Local and Municipal Government.—The units of local and municipal government are counties, cities, incorporated boroughs, and townships. County officers consist of sheriffs, coroners, prothonotaries, register of wills, recorders of deeds, district attorney, clerk of the courts, commissioners, auditors, and controllers who are elected. Three county commissioners and three county auditors are elected in each county for terms of four years, except in counties having a population over 100,000 inhabitants, in which a controller takes the place of the county auditor. Debts of any county, city, borough, township, or district must not exceed 7 per cent of the taxable property, except for certain purposes, when it may be increased to 10.

Miscellaneous Constitutional and Statutory Provisions.—Except by two-thirds vote of all members of each House, appropriations of money must not be made to any charitable or public institution not under the absolute control of the Commonwealth other than normal schools established by law for the professional training of teachers. The Legislature of 1915 created a State commission of agriculture. The same Legislature passed a comprehensive workman's compensation act. There is a legislative reference bureau, created in 1909, to assist in the

preparation of measures passed in the Legislature and to perform other duties in connection with the legislative sessions. There is an excellent child-labor law. There are many measures providing for the safety and health of persons working in and about the coal mines. A public-utilities commission was created by the Legislature of 1913, to take the place of the railroad commission. In 1913 electrocution was substituted for hanging as a method of execution.

Finances. The first direct State tax was levied in 1785, but was discontinued in 1789. Taxes were very unpopular, and the State expected to cover its expenditures by income from public property, sale of public lands, etc. Some taxes were introduced in the beginning of the nineteenth century, but in 1810 the revenue from them amounted to only 20 per cent of the total receipts. In 1825 there were no direct State taxes. About this time the construction of public improvements, which had been going on in a quiet way since 1789, became the cry of the day. Loans were the only available source of necessary means. In 1821 the public debt incurred during the War of 1812 amounted to only \$1,230,000, but new loans followed one another in great rapidity. Canals, roads, bridges, and railroads were built. Between 1789 and 1828 more than \$22,000,000 was spent on these improvements. In 1834 the system of canals and railroads to connect Pittsburgh and Philadelphia was completed at the cost of more than \$14,500,000, and lateral canals were added in 1838 at the cost of almost \$6,500,000. The large sum (more than \$12,000,000) which the United States Bank furnished in 1837, partly as a bonus and partly as a loan to the State, in exchange for a State charter, further stimulated this feverish activity. The State debt was \$24,500,000 in 1835 and in 1842 reached \$40,000,000. Expecting large returns from these improvements, the State did not provide a thorough system of taxation. Interest had to be paid by means of further loans. The credit of the Commonwealth was therefore so much impaired in 1840 that failure was threatening. The income from the improvements did not even cover their expenses, and a law was passed in 1840 imposing small taxes on banks, personal property, and salaries. The revenue from this law did not cover even a tenth part of the expenditures, and the interest on the bonds continued to be paid by issue of special bonds. In 1844 a radical change was made in the financial system. A comprehensive tax was imposed upon all property, stocks, incomes, etc., and cash payment of interest was resumed the next year. For 15 years the debt remained on the same level; the State was not able to cancel any of its obligations and kept on refunding the maturing bonds. In 1857 and 1858 the State works, which were built at the expense of over \$75,000,000, were sold for \$11,000,000 to the Pennsylvania Railroad Company and the Sunbury and Erie Railroad Company, and a gradual reduction of the State debt dates from that time.

In 1860 the debt decreased to \$38,000,000, but the military loan of 1861 increased it by \$3,000,000. A steady decline came after the war. In 1870 the debt was \$28,980,071; in 1880, \$21,561,990; in 1890, \$12,349,920; and from 1895 to 1902 it remained \$6,815,299. By Nov. 30, 1906, bonds were bought at a high premium by the sinking fund to such an amount that the debt was reduced to \$3,646,167, against which

the sinking fund had \$3,586,021. These results were only possible by vigorous taxation. The Law of 1844 taxed all property, but real estate was released from State taxation in 1867. The income tax survives, but contributes a trifling sum. The taxes on personal property and inheritances are productive of more revenue. The main sources, however, are the taxes on corporation stocks and receipts and various licenses, Pennsylvania having introduced the high-license principle. On Nov. 30, 1914, there was a balance on hand in the treasury of \$7,427,208. The receipts for the fiscal year were \$31,441,050 and the expenditures \$31,578,111. The bonded debt at the end of the year was \$651,110, against which there was the sinking fund of \$811,733.

Militia. The males of militia age in 1910 numbered 1,788,619. The total strength of the organized militia on Jan. 1, 1914, was 10,190 men and 745 officers. The State militia includes four brigades of infantry, two squadrons of cavalry, two batteries of field artillery, a company of signal corps, and a company of sanitary troops.

Population. Pennsylvania ranked second in population in 1910. The population at each Federal census was as follows: 1790, 434,373; 1800, 602,365; 1810, 810,091; 1820, 1,049,458; 1830, 1,348,233; 1840, 1,724,033; 1850, 2,311,786; 1860, 2,906,215; 1870, 3,521,951; 1880, 4,282,891; 1890, 5,258,113; 1900, 6,302,115; 1910, 7,665,111. The estimated population for 1915 was 8,383,992. The urban population (in places of 2500 or more) in 1910 was 4,630,669. There was in that year an average of 171 persons to the square mile. The total population consisted of 3,942,206 males and 3,772,905 females. There were 6,028,994 native whites and 1,438,719 foreign-born whites. The negroes numbered 193,919, and there were a few Indians, Chinese, and Japanese. Of the foreign-born whites 17.5 per cent came from Austria, 16.7 per cent from Russia, 13.6 per cent each from Germany and Italy, and 11.5 per cent from Ireland. Some 90.6 per cent of the total native population were born in the State. New York contributes 9.4 per cent of those born in other States and Maryland 1.8 per cent. There were 2,309,026 males of 21 years of age and over. There were 10 cities with a population of 50,000 or over in 1910. These with their population in 1910 and 1914 (estimated) are as follows: Philadelphia, 1,549,008 and 1,657,810; Pittsburgh, 533,905 and 564,878; Scranton, 129,867 and 141,351; Reading, 96,071 and 103,361; Wilkes-Barre, 67,105 and 73,660; Erie, 66,525 and 72,401; Harrisburg, 64,186 and 69,493; Johnstown, 55,482 and 64,642; Altoona, 52,127 and 56,553; Allentown, 51,913 and 60,297.

Education. The first provision for education in the wider sense was made by William Penn, who in his "Frame of Government" provided that "The Governor and Provincial Council shall erect and order all public schools," and "that the children within this province within the age of twelve years shall be taught some useful trade or skill." The second Assembly in 1683 strengthened the clause by providing for compulsory instruction in reading and writing as well as in some manual trade. The first free public schools were opened in 1769 by settlers from Connecticut, but it was not until 1834 that the free public-school system was successfully established.

There were, in 1910, 354,290 persons of 10 years of age or over who were illiterate. This was a percentage of 5.9 of the total population, a higher percentage than is found in any other of the Middle Atlantic States, due chiefly to the large element from southeast Europe in the population. The percentage among native whites of native parentage was 1.4, among native whites of foreign or mixed parentage 1.1, among foreign-born whites 20, and among negroes 9.1. The total school population in the same year was 2,194,303, of which 1,366,541 attended school. The report of the State Superintendent of Public Instruction for 1914 shows that there were in that year 2568 school districts, with 37,787 schools and 15,306 schoolhouses. The whole number of pupils was 1,401,325, and the average daily attendance was 1,124,951. In all the schools there were 39,596 teachers. Of these 31,246 were women. The average monthly salary of male teachers was \$68.06, of female teachers \$49.88. The average length of the school term was 8.6 months. In 1914 there were 207 first-grade high schools, 269 of the second grade, and 408 of the third grade. The total expenditures were \$52,544,036, of which \$23,834,407 was expended in teachers' salaries.

The public-school system is under the direct supervision of the State Superintendent of Public Instruction, who is appointed by the Governor. In each county is a superintendent elected by the school directors, who in turn are elected by the people. A new school code adopted in 1911 increased the powers of the State Board of Education and provided for a permanent school fund, consisting of all escheated estates and revenue derived from the sale of land and public property and from the forest reservations. A bureau of vocational education, established in 1913, has done effective work along special lines of instruction and agriculture, home economics, manual training, and the industrial arts. State aid is given to such vocational schools as are approved by the State Board of Education. During the year 1913-14, 21 districts in 17 different counties qualified for State aid by establishing various types of vocational schools or departments. During the year 1914-15 at least 20 more districts in 11 other counties were added to this list. The most serious problem of the State is rural schools, and considerable progress has been made in improving their condition.

There are State normal schools at West Chester, Millersville, Kutztown, East Stroudsburg, Mansfield, Bloomsburg, Shippensburg, Lock Haven, Indiana, California, Slippery Rock, Edinboro, and Clarion.

There are many institutions of collegiate rank. The most important of these are the University of Pennsylvania at Philadelphia, Pennsylvania State College at State College, University of Pittsburgh at Pittsburgh, Lafayette College at Easton, Lehigh University at South Bethlehem, Swarthmore College at Swarthmore, Pennsylvania College at Gettysburg, Dickinson College at Carlisle, Haverford College at Haverford, Franklin and Marshall College at Lancaster, Temple University at Philadelphia, Washington and Jefferson College at Washington, and Ursinus College at Collegeville. Colleges for women are the Allentown College for Women at Allentown, Beaver College at Beaver, Moravian College at Bethlehem, Blairsville College at Blairsville, Bryn Mawr College at Bryn

Mawr, Wilson College at Chambersburg, Irving Female College at Mechanicsburg, and Pennsylvania College for Women at Pittsburgh. Roman Catholic colleges are St. Vincent College at Beatty, La Salle College and St. Joseph's College at Philadelphia, and Duquesne University of the Holy Ghost at Pittsburgh. The Carnegie Technical University at Pittsburgh is the best-known scientific institution. There are important medical schools in Philadelphia and in Pittsburgh and theological seminaries at Chester, Mount Airy, Meadville, Beatty, Philadelphia, Gettysburg, Bethlehem, Lancaster, and Pittsburgh. The United States Indian School at Carlisle is a famous institution for the training of Indians.

Charities and Corrections. The State charitable and correctional institutions include the State Institution for the Feeble-Minded of western Pennsylvania at Polk, State Hospital for the Criminal and Insane at Fairview, Homœopathic State Hospital for the Insane at Allentown, State Hospital for the Insane at Danville, Pennsylvania State Lunatic Hospital at Harrisburg, State Hospital for the Insane at Norristown, State Hospital for the Insane at Warren, State Asylum for the Chronic Insane at Wernersville, Home for the Training in Speech of Deaf Children at Philadelphia, Pennsylvania Oral School at Scranton, Eastern Penitentiary at Philadelphia, Western Penitentiary at Pittsburgh, Pennsylvania Industrial Reformatory at Huntingdon, Pennsylvania Reform School at Morganza, and Pennsylvania Soldiers and Sailors Home at Erie. The average number of persons in these institutions in 1914 was 15,118. There were paid for their maintenance \$4,295,993. In addition to these there are a number of semi-State institutions which receive State aid. There are State hospitals at Ashland, Blossburg, Coaldale, Connellsville, Hazleton, Mercer, Nanticoke, Philipsburg, Scranton, and Shamokin. The supervision of the charities and corrections is in the hands of the Board of Public Charities.

Religion. Roman Catholics form over one-sixth of the population. The principal Protestant denominations are the Methodist, the Presbyterian, the Lutheran, the Baptist, the Reformed church, the Protestant Episcopal, and the United Brethren.

History. Henry Hudson in the *Half Moon* anchored in Delaware Bay, Aug. 28, 1609, and founded the Dutch claim to the bay and river, though he did not land. After 1614 exploring parties were sent out and trading posts founded on the east side of the river. Gustavus Adolphus of Sweden planned to found a colony in America, and under his daughter, Queen Christina, Peter Minuit, formerly Governor of New Netherland, built Fort Christina within the present limits of Delaware in 1638 and began to trade with the Indians. John Printz arrived with other colonists in 1643 and built New Gottenburg on Tinicum Island, the first settlement within the present limits of Pennsylvania. The Dutch looked with jealousy upon these and other Swedish settlements afterward founded and to offset the advance made by the Swedes built Fort Casimir at the site of the present town of New Castle, Del. This was captured by the Swedes in 1654, but in September, 1655, Governor Stuyvesant of New Netherland appeared in the bay with seven vessels and overthrew the Swedish authority. The city of Amsterdam had furnished much of the money for

this conquest, and in return the southern settlements were assigned to that city under the name of New Amstel. The Company colony was left in charge of Governor Stuyvesant, but in 1663 the two were reunited. When the Duke of York took possession of New Netherland in 1664, the settlements on the Delaware were included and remained attached to New York until 1682. On March 4, 1681, William Penn (q.v.), in return for a debt of £16,000, owed to his father by Charles II, secured a grant of the territory west of the Delaware River between 40° and 43°, extending to the west five degrees, at an annual rent of two beaver skins and one-fifth of the gold and silver ore discovered in the region. As New Castle was supposed to be on or near the fortieth degree, the east boundary was to begin where a circle, having its centre at that settlement, 12 miles in radius, intersected the Delaware River and the south boundary to begin at the point where that circle intersected the fortieth degree. Full feudal rights, both to the soil and to the government, were granted. On Dec. 6, 1682, Penn secured from the Duke of York the grant of the soil of the lower settlements and by consent assumed governmental rights. These settlements were within the original Maryland patent, but Lord Baltimore complained in vain. They remained attached to Pennsylvania, though with separate legislatures after 1703, until the Revolution, under the names "the Lower Counties" or "the Territories." The south boundary caused much trouble later. When it was found that the fortieth degree was north of the present site of Philadelphia, the ingenious theory was announced that the beginning of the fortieth degree was at 39°. The matter was finally settled by a compromise in 1760 (see MASON AND DIXON'S LINE), when also the north boundary was fixed at 42°.

Upon receiving the grant Penn sent over his kinsman, William Markham (q.v.), as Deputy Governor, and followed himself in 1682, arriving at Uplands (now Chester) October 27. A few days later he concluded a treaty with the Indians, though the purchase of the lands could not have taken place until later. A "Frame of Government" previously published in England was submitted to the first General Assembly in December, 1682, and was adopted together with the "great law," made up largely of the suggestions of the Proprietor. Universal suffrage and entire religious toleration made the scheme notable. Settlers came over in great numbers, chiefly Quakers and Germans from the Palatinate. Philadelphia, which had been planned before Penn left England, grew rapidly and before 1683 contained more than 500 inhabitants, while more than 3000 settlers had come to the province. Land was offered at 40 shillings the hundred acres, subject to a quitrent of a shilling a year. Penn returned to England in 1684, leaving the Council in charge, but its authority was soon disputed by the Lower House, which had a veto power on legislation, though it could not originate measures. Slanders were circulated in England, and in 1693 the province was resumed by William III and attached to New York. Governor Fletcher met with little success in his attempts to secure aid for his Indian wars and had several contests with the Legislature. The province was restored to Penn in August, 1694, and in 1696 a new and more democratic constitution was adopted with the Proprietor's consent. Penn's second and last

visit to the province lasted from December, 1699, to October, 1701. During this time he granted the Charter of Privileges, adopted Oct. 26, 1701, which served as a constitution until the Revolution. The governors whom Penn appointed were involved in frequent disputes with the Assembly, and in consequence the Proprietor grew discouraged. In 1712 he was on the point of selling the province to the crown for £12,000, but a paralytic stroke prevented the completion of the sale. Though the province was a constant source of expense to him, it made his descendants rich. After Penn's death, in 1718, the disputes between the Assembly and the Proprietors continued with renewed vigor.

Immigration was large. There were Scotch-Irish in the province as early as 1698, and after 1730 they came in great numbers. These generally pushed on to the frontier, as did also the later influx of Germans. The first years were free from Indian warfare, but after 1740 the Indians were restless and soon became openly hostile. The efforts of the French were successful, and forts were established on the Ohio. The province sent few men to the aid of General Braddock in his expedition against Fort Duquesne in 1755; but his defeat aroused the Assembly, and a chain of forts was erected at a cost of £85,000. Until after 1764 danger from the Indians was constant. Meanwhile, in 1753, Connecticut laid claim to a tract of land on the Susquehanna, 70 miles west of the Delaware, under the charter of 1602, which granted to Connecticut the land to the forty-first degree. A company was formed, the land was purchased from the Indians in 1754 (though previously purchased by Pennsylvania), and Susquehanna County was formed. Settlers went in, and the formation of a distinct colony was considered. The Indians claimed that the purchase was made by fraud and protested vigorously. Armed forces were sent from eastern Pennsylvania and brought on the so-called Pennamite War; the dispute had its influence in causing the Wyoming Massacre in 1778. See WYOMING VALLEY.

The Colony's agent, Benjamin Franklin, vigorously resisted the Stamp Act, and in July, 1774, a Provincial Congress met at Philadelphia, adopted resolutions, and elected delegates to the first Continental Congress, to be held at Philadelphia. The Provincial Convention in 1775 authorized the Committee of Safety to prepare a system of defense for the Colony. Troops were raised, and boats were built. After the Declaration of Independence the proprietary government ceased in Pennsylvania, and a State constitution was drawn up, Sept. 28, 1776. It provided for a Supreme Executive Council, one Legislative House, and a Board of Censors. The Royal Charter was annulled by the King in 1778, and the State secured the commutation of the quitrents in 1779. During the Revolution the eastern part of the State was the scene of important operations. Philadelphia was at different times the seat of the Continental Congress and the British headquarters. The question of the west boundary was settled in 1784, with the consent of Virginia, by measuring five degrees west from the Delaware River and then due north. The possession of the Wyoming lands was given to the State by decision of Congress in 1782, but when it was found that the line of 42° excluded Lake Erie, Congress in 1788 authorized the addition of the triangle bordering upon the lake. In 1787 the State

ratified the Federal Constitution. In 1790 a new constitution was adopted. The growth and prosperity of the State was marked, though the population was turbulent. The Whisky Rebellion (1794) grew out of the unwillingness of the Scotch-Irish to submit to the excise tax. The imposition by the national government of the window tax led to the Hot-Water Rebellion among a part of the German population in 1798. Internal improvements were projected early, and the Schuylkill Canal was begun in 1815 and completed in 1825. From 1829 to 1836 the projected improvements called for the construction of 292 miles of canal and 126 miles of railroad, at a total cost of \$35,000,000. The first bill for a public-school system was passed in the face of violent opposition in 1834. Though both iron and coal had been known to exist before the Revolution, it was not until 1839 that anthracite was successfully applied to the manufacture of iron. The first oil well was sunk near Titusville in 1859.

At the outbreak of the Civil War five companies of Pennsylvania troops were the first to arrive in Washington under President Lincoln's call for troops on April 15, 1861, and 25 regiments were formed during the month. The draft was necessary before the end of the war, but troops were furnished. The State was three times invaded, twice at Chambersburg and once by General Lee's army, which fought the battle of Gettysburg (q.v.). Since the war the chief events of importance have been the rapid growth of the steel, oil, and coal industries and frequent labor troubles. In 1877 a great strike of railroad employees led to violence and the defeat of the militia at Pittsburgh. The dispatch of regular troops was necessary to quell the disorder. On May 31, 1889, a dam at the outlet of Conemaugh Lake broke, and a great wall of water overwhelmed Johnstown (q.v.) and several smaller towns, drowning more than 2000 people and destroying property to the value of \$10,000,000. The strike at the Carnegie Company's mills at Homestead, near Pittsburgh, July 6, 1892, was one of the most serious ever known in America. Martial law was declared, and the entire militia force was called out. An extensive strike of coal miners in Hazelton region in 1900 was followed by a general strike in the anthracite region in 1902.

A new State capitol was completed at Harrisburg in 1907. Its construction was authorized in 1901, when an appropriation of \$4,000,000 was made for its erection. An examination into the books of his department made by William H. Berry, who became State Treasurer in May, 1906, revealed great discrepancies between the estimates and expenditures for furnishing and decorating the capitol. The Legislature of 1907 authorized a commission to investigate the matter and found that several millions of dollars which had not been accounted for had been paid for furnishing and decorating the capitol. Indictments were found against the contractor, the architect, and several former State officials. Several of these men after a prolonged trial were found guilty.

In 1908 Philander C. Knox, United States Senator, was appointed Secretary of State. In the presidential election of 1908 Taft received 745,779 votes and Bryan 448,785. In January, 1909, Boies Penrose was reelected by the Legislature for United States Senator for his third term.

In 1910 the Republican party nominated John K. Tener for Governor and the Democrats Webster Grim. A body of Republicans and Democrats who were dissatisfied with the results of their party conventions organized a new party known as the Keystone Independent party and nominated William H. Berry for Governor. The entire Republican ticket was elected, but Mr. Berry received nearly three times the number of votes cast for the Democratic nominee.

In 1912 the Independent or Progressive elements in both great parties developed such strength that the old leaders were practically deprived of their power. In the Republican party the advocates of Mr. Roosevelt's candidacy were able to carry the primaries for delegates to the national and State conventions. After the Republican National Convention and the nomination of Taft and Sherman, the Progressive party organized. At the Democratic primaries Wilson had practically no opposition. At the election he received 395,619 votes, Roosevelt 447,426, and Taft 273,305. In June, 1913, survivors of the battle of Gettysburg from both the Union and the Confederate armies met in a great reunion on the battlefield to celebrate the fiftieth anniversary of the battle. In the primary elections held in 1914 the Republicans nominated Martin G. Brumbaugh for Governor and renominated Senator Penrose; the Democrats nominated A. Mitchell Palmer, Representative in Congress, for Senator, and Vance McCormick for Governor; the Progressives nominated Gifford Pinchot for United States Senator and William D. Lewis for Governor. In the elections the Republicans elected Brumbaugh Governor by a vote of 590,701 to 452,882 for McCormick. Senator Penrose was reelected. In this election the Republicans showed a gain of over 300,000, the Democrats a gain of over 50,000, and the Progressives a loss of over 150,000 votes compared with 1912.

In national elections the State was at the outset Federalist, but, in 1796, 14 of its 15 votes were cast for Jefferson. Eight votes were cast for him again in 1800, while seven went to the Federalist candidate. From this time until 1840 the State was Democratic. In 1835 the Antimasonic party succeeded in electing the Governor, and the agitation gave the State to the Whig electors in 1840. In 1838 a dispute between the Democrats and Whigs concerning the results of an election in one of the State congressional districts caused much excitement, each party contending that it had elected not only the Congressman, but the members of the State Legislature in that district. The disturbance, which was later known as the Buck-Shot War, was, however, short-lived, and the dispute was settled in favor of the Democrats. The State gave its vote to Polk in 1844, to Taylor in 1848, and in 1852 and 1856 to the Democratic candidates. In 1912 Roosevelt, Progressive, carried the State. Since 1860 Pennsylvania has been Republican in national affairs, though, by reason of certain factional fights in the Republican ranks, a Democratic Governor has been twice elected.

GOVERNORS OF PENNSYLVANIA

UNDER THE SWEDES

Peter Minuit.	1638-41
Peter Hollandaer	1641-43
John Printz	1643-53
John Pappogoya	1653-54
John Claudius Rysingh	1654-55

UNDER THE DUTCH

Peter Stuyvesant, Director General of the New Netherland	1655-64
Derek Smidt, Schout Fiscal.	1655
John Paul Jacquet, Vice Director.	1655-57

COLONY OF THE CITY

Jacob Alricks, Director.	1657-59
Alexander d'Hinyossa	1659-63

COLONY OF THE COMPANY

Goeran Van Dyck, Schout Fiscal	1657-58
William Beekman, Vice Director	1658-63
Alexander d'Hinyossa, Director of United Colony	1663-64

UNDER THE ENGLISH

Richard Nicolls	1664-67
Francis Lovelace	1667-73

RECAPTURED BY THE DUTCH 1673

Anthony Colve, Governor-General	1673-74
Peter Alricks, Commander	1673-74

UNDER THE ENGLISH

Sir Edmund Andros	1674-81
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PROPRIETARY GOVERNMENT

William Markham, Deputy Governor	1681-82
William Penn, Proprietor	1682-84
The Council (Thomas Lloyd, President)	1684-88
The Five Commissioners.	1688
Capt John Blackwell	1688-90
The Council (Thomas Lloyd, President)	1690-91
Thomas Lloyd, Deputy Governor	1691-93
William Markham, Deputy Governor Lower Counties	1691-93

UNDER THE CROWN

Benjamin Fletcher, Gov. of New York, Governor	1693-95
William Markham, Lieutenant Governor	

PROPRIETARY GOVERNMENT

William Markham, Lieutenant Governor	1695-99
William Penn, Proprietor	1699-1701
Andrew Hamilton, Lieutenant Governor	1701-03
The Council (Edward Shippen, President)	1703-04
John Evans, Lieutenant Governor	1704-09
Charles Gookin,	1709-17
Sir William Keith,	1717-26
Patrick Gordon,	1726-36
The Council (James Logan, President)	1736-38
George Thomas, Lieutenant Governor	1738-47
The Council (Anthony Palmer, President)	1747-48
James Hamilton, Lieutenant Governor	1748-54
Robert Hunter Morris,	1754-56
William Denny,	1756-59
James Hamilton,	1759-63
John Penn,	1763-71
The Council (James Hamilton, President)	1771
Richard Penn, Lieutenant Governor	1771-73
John Penn,	1773-76
Council of Safety (Thomas Wharton, President)	1776-77

PRESIDENTS OF THE SUPREME EXECUTIVE COUNCIL

Thomas Wharton, Jr.	1777-78
George Bryan (acting)	1778
Joseph Reed	1778-81
William Moore	1781-82
John Dickinson	1782-85
Benjamin Franklin	1785-88
Thomas Mifflin	1788-90

GOVERNORS OF STATE

Thomas Mifflin	Federalist	1790-99
Thomas McKean	Democratic-Republican	1799-1808
Simon Snyder	"	1808-17
William Findlay	"	1817-20
Joseph Heister	Independent Democrat	1820-23
John Andrew Shulze	Democratic-Republican	1823-29
George Wolf	"	1829-35
Joseph Ritner	Antimasonic	1835-39
David Rittenhouse Porter	Democratic	1839-45
Francis Rawn Shunk	"	1845-48
William Freame Johnston	Whig	1848-52
William Bigler	Democratic	1852-55
James Pollock	"	1855-58
William Fisher Packer	"	1858-61
Andrew Gregg Curtin	Republican	1861-67
John W. Geary	"	1867-73
John F. Hartranft	"	1873-79
Henry M. Hoyt	"	1879-83

GOVERNORS OF STATE—Continued

Robert E. Pattison . . .	Democratic	1883-87
James A. Beaver . . .	Republican	1887-91
Robert E. Pattison . . .	Democratic	1891-95
Daniel H. Hastings . . .	Republican	1895-99
William A. Stone . . .	"	1899-1903
Samuel W. Pennypacker . .	"	1903-07
Edwin S. Stuart . . .	"	1907-11
John K. Tener . . .	"	1911-15
Martin G. Brumbaugh . .	"	1915-

Bibliography. *Pennsylvania Archives*, 1st series, vols. i-xii; 2d series, vols. i-xix; 3d series, vols. i-xxx; 4th series, vols. i-xii; 5th series, vols. i-viii; 6th series, vol. i (Harrisburg, 1874 et seq.); *Colonial Records* (16 vols., Philadelphia and Harrisburg, 1851-53), a supplement to the State archives; Samuel Hazard (comp.), *Hazard's Register of Pennsylvania* (16 vols., Philadelphia, 1828-35); Robert Proud, *History of Pennsylvania* (2 vols., ib., 1797-98); Carpenter and Arthur, *History of Pennsylvania from its Earliest Settlement* (ib., 1882); S. G. Fisher, *Making of Pennsylvania* (ib., 1896); W. R. Shepherd, *History of Proprietary Government in Pennsylvania* (New York, 1896); S. G. Fisher, *Pennsylvania: Colony and Commonwealth* (Philadelphia, 1897); Isaac Sharpless, *History of Quaker Government in Pennsylvania* (ib., 1898-99); John Fiske, *Dutch and Quaker Colonies in America* (2 vols., Boston, 1899); A. S. Bolles, *Pennsylvania, Province and State: A History from 1609-1790* (2 vols., Philadelphia, 1899); F. R. Diffenderfer, *German Immigration into Pennsylvania* (Lancaster, 1900); Isaac Sharpless, *Two Centuries of Pennsylvania History* (2 vols., Philadelphia, 1900); Peter Roberts, *Anthracite Coal Industry* (ib., 1901); G. I. Reed and others (comp.), *Century Cyclopedia of History and Biography of Pennsylvania* (2 vols., Chicago, 1904); A. K. McClure, *Old Time Notes of Pennsylvania* (2 vols., Philadelphia, 1905); A. L. Bishop, *State Works of Pennsylvania* (New Haven, 1907); J. M. Swank, *Progressive Pennsylvania* (Philadelphia, 1908); W. P. Clarke, *Official List of the Militia and the National Guard of the State of Pennsylvania* (3 vols., ib., 1909); S. W. Pennypacker, *Pennsylvania in American History* (ib., 1910); C. A. Hanna, *Wilderness Trail* (2 vols., New York, 1911); A. C. Myers, *Narratives of Early Pennsylvania, West New Jersey, and Delaware, 1630-1707* (ib., 1912); Oscar Kuhns, *German and Swiss Settlements in Pennsylvania* (2d ed., ib., 1914); James Veech, *Monongahela of Old Uniontown, Pa.*, 1914). For geology and natural resources, consult the publications of the State Geological Survey (Harrisburg).

PENNSYLVANIA, HISTORICAL SOCIETY OF. An association organized in Philadelphia, Dec. 2, 1824, and incorporated June 2, 1826. Its object is the elucidation of history, with special reference to that of Pennsylvania. It has a valuable historical and genealogical library at Philadelphia. The society has a subscribed publication fund of \$40,000, the revenue from which is expended in printing matter of historic interest. This fund has published 14 volumes of *Memoirs of the Society* and 39 volumes of the *Pennsylvania Magazine of History and Biography*, issued in quarterly numbers. The society has published a historical map of the State, a volume of *Collections*, one of *Bulletins*, and one on *Pennsylvania and the Federal Constitution*. The library contained, in 1915, 152,000 books, 258,000 pamphlets (special), and 5200 volumes of manuscripts.

PENNSYLVANIA, UNIVERSITY OF. An institution for higher education in Philadelphia, Pa., established in 1740 as a charitable school and raised to the grade of an academy in 1751 through the efforts of an association of citizens formed in consequence of a pamphlet published by Benjamin Franklin, entitled *Proposals Relative to the Education of Youth in Pennsylvania*. The academy, consisting of an English, a mathematical, and a Latin school, each under a master, with subordinate tutors and ushers, proved so successful that in 1753 it received a charter from the Proprietors, Thomas and Richard Penn. Two years later it had attained a standard which justified the granting of degree-conferring powers, and in 1755 the institution was converted into the College and Academy of Philadelphia. During the agitated times of the wars with the French, the provost, the Rev. William Smith, opposed so vehemently the nonresistance policy of the Pennsylvania Legislature that he was arbitrarily thrown into prison, where he faithfully received his classes. He was subsequently sent to England to raise funds for an endowment, and there met the commissioner from King's (Columbia) College on a similar mission. Through the influence of the Archbishop of Canterbury they received a circular letter from the King, and succeeded in raising a considerable endowment for each college. On Dr. Smith's return a letter to the trustees from the Archbishop of Canterbury, Thomas and Richard Penn, and the Rev. Samuel Chandler represented that the institution was originally founded and carried on for the benefit of a mixed body of people; that at the time of making the collection its officers included representatives of various Christian denominations; and, since jealousies had arisen between parties, it was recommended to the trustees to make a fundamental declaration to prevent inconveniences of this kind. Accordingly, in 1764, the trustees bound themselves and their successors to retain the original wide plan of the institution and "to use their utmost endeavors that the same be not narrowed, nor the members of the Church of England, or those dissenting from them (in any future election to the principal offices), be put on any worse footing in this seminary than they were at the time of receiving the royal brief." In 1779 this resolution was construed by the Legislature into a "narrowing of the foundation," and was seized as a pretext for confiscating all the rights and properties of the college, which were bestowed upon a new organization, called in the charter the "Trustees of the University of the State of Pennsylvania." Ten years later these rights and properties were restored, and in 1791 an Act was passed amalgamating the old college with the new university under its present title. In 1872 the university was removed from the centre of the city to the present site near the west bank of the Schuylkill River.

The departments of the university are the College, the School of Arts, the Towne Scientific School, the Wharton School, the departments of Philosophy (Graduate School), Law, Medicine, Dentistry, Veterinary Medicine, and School of Education; the Wistar Institute of Anatomy and Biology; the Henry Phipps Institute; the Laboratory of Hygiene; the Veterinary Hospital; the Library, Psychological Clinic, and the Flower Astronomical Observatory; Physical Education, and the University Museum The

School of Arts offers courses in arts and science, biology and music. The Towne Scientific School offers courses in architecture, science and technology, mechanical, electrical, civil, and chemical engineering, and chemistry. Free tuition in the university is offered through the two Penn scholarships, filled by the Governor of the State, Philadelphia free city scholarships, competitive State scholarships, and general scholarships not confined to special localities. The college courses in arts and sciences and in biology are planned to enable the student to complete his work in three, four, or five years, at his option, the successful completion of 60 units of work being required for graduation. Students are not permitted to take less than 12 units a year, a unit being defined as one hour's work a week for one year in lectures or recitations, or two hours' work a week in laboratory practice. Provision is made for a senior composite year, in which nine units are credited to the work of the first-year class in medicine. In the Towne Scientific School the technical courses cover four years. The Wharton School offers courses in finance and commerce. A feature of the Graduate School is the generous establishment of fellowships and scholarships on the Harrison Foundation.

Of the professional schools of the university that of medicine is particularly well known. The Dental School has a wide reputation, especially in Australia and in Spanish-American countries. The Flower Astronomical Observatory is situated 2 miles beyond the city limits, and there is a working observatory in the grounds. The university buildings stand on Woodland Avenue, on property covering more than 100 acres in the city proper, and provide dormitory accommodations for more than 900 students. They include a university hospital, with a training school and home for nurses, and the Howard Houston Hall, a students' club.

The university confers the degrees of bachelor of arts, laws, music, and science, master of arts and science, doctor of philosophy, medicine, dental surgery, and veterinary medicine, and degrees in civil, mechanical, electrical, and chemical engineering and in education and economics. In 1915 the faculty numbered 589 and the student body 7150. The library contained 421,700 catalogued volumes and 50,000 unbound volumes.

The heads of the university, since its beginning as a collegiate institution in 1755, have been: William Smith (1755-80); John Ewing (1780-1802); John McDowell (1807-10); John Andrews (1810-13); Frederick Beasley (1813-28); William Heathcote de Lancey (1828-33); John Ludlow (1834-53); Henry Vethake (1854-59); Daniel Raynes Goodwin (1860-68); Charles Janeway Stillé (1868-80); William Pepper (1881-94); Charles Custis Harrison (1894-1911); Edgar Fahs Smith (1911-). Consult E. E. Slosson, *Great American Universities* (New York, 1910), and G. E. Nitzsche, *University of Pennsylvania* (5th ed., Philadelphia, 1914).

PENNSYLVANIA, WESTERN UNIVERSITY OF. See PITTSBURGH, UNIVERSITY OF.

PENNSYLVANIA COLLEGE. An institution for higher education, founded at Gettysburg, Pa., in 1832. The college is nonsectarian and the curriculum offers 10 groups of studies, 3 leading to the degree of A.B. and 7 to the degree of S.B. There are departments of civil,

municipal, mechanical, and electrical engineering in addition to the regular scientific courses. In connection with the college is a preparatory department. There were in the collegiate department, in 1913, 332 students and in the preparatory departments 80. The faculty numbered 31, of whom 7 were in the preparatory departments. The college has an endowment of about \$395,000 and an annual income of about \$53,000. The grounds and buildings are valued at \$325,000. In 1915 a movement was under way to raise \$140,000 for the erection of a science hall and for a new preparatory department. The library contains about 37,000 volumes. The president in 1915 was William Anthony Granville.

PENNSYLVANIA COLLEGE FOR WOMEN. An institution for higher education of women, founded at Pittsburgh, Pa., in 1869, under the auspices of the Presbyterian church. It is situated in Woodland Road, in the residential section of Pittsburgh. The college offers the regular courses, with special advanced courses in social service, music, and expression. It has a preparatory department, with certificate privileges in all colleges. The total enrollment in 1915 was 250, and the faculty numbered 28. The value of the college property in the same year was \$400,000. The library contains about 3000 volumes.

PENNSYLVANIA DUTCH, or **PENNSYLVANIA GERMAN.** The language of the Germans who emigrated to Pennsylvania between 1683 (when Pastorius settled in Germantown) and the middle of the eighteenth century, though the great outpouring from German lands did not begin till 1717. During this time some 100,000 settled principally in the southeastern counties of the State, such as Lancaster, York, Franklin, Cumberland, Berks, Schuylkill, and Lehigh, spreading diagonally through the Colony from the western bounds of the counties of Bucks and Philadelphia to the Maryland line. The emigration was due "partly to the ravaging of the Palatinate and the neighboring provinces by the armies of Louis XIV, partly to religious persecution, partly to the social system of Germany, which operated to hold down the working classes, and partly to that longing for variety which has at various times come over sections of the Germanic race" (Channing). The settlers came chiefly from the Rhenish Palatinate, Württemberg, and Switzerland, with a sprinkling from the Lower Rhine, Bavaria, Alsace, and Saxony. As most of the dialects spoken by these people belonged to the Alemanic and Franconian groups (see **GERMAN LANGUAGE**), the idiom of the Pennsylvania Dutch is really High German, and the confusion with Dutch is due to the fact that the settlers called their language *Deitsch* (a dialectal pronunciation of *deutsch*, German). Although a variety of dialects were originally represented, that of the Rhenish Palatinate (Rhenio-Franconian) so predominated and influenced the others that the language may be regarded as fairly homogeneous. Owing to their segregation in religious communities, the emigrants clung tenaciously to their mother tongue for a long time, but were gradually compelled by force of circumstances to accept many English words, especially those connected with official matters, until the dialect can best be described as a fusion of Franconian, Alemannic, and other German dialects, with an admixture of English varying

from 1 per cent in the rural districts to a large percentage in the towns.

The language exhibits the characteristic dialectic darkening of *a* to *o* (*schlof* for *Schlaf*; *jor* for *Jahr*), further, the fronting of *ö* to *e* (*here* for *horen*; *bes* for *böse*) and of *ü* to *i* (*bicher* for *Bucher*). German *ei* and *äu* generally appear as *e* (*del* for *Teil*; *bem* for *Baume*). The consonants *p*, *pp*, and *d* are not shifted (*pund* for *Pfund*; *kloppe* for *klopfen*; *kopp* for *Kopf*; *dag* for *Tag*; *mudder* for *Mutter*). Final vowels and inflectional *n* are dropped (*mid* for *müde*; *bëm* for *Bäume*; *finne* for *finden*; *gfunne* for *gefunden*).

The writings of the Pennsylvania Germans have been largely of a religious character, such as hymns and polemical pamphlets. They were written as a rule in the High German literary dialect, with, however, a number of exceptions. Within the last 40 years, however, a number of poems in the dialect have been written.

Bibliography. S. S. Haldeman, *Pennsylvania Dutch* (Philadelphia, 1872); Oswald Seidensticker, *Bilder aus der deutsch-pennsylvanischen Geschichte* (2d ed., New York, 1886); M. D. Learned, *The Pennsylvania German Dialect* (Baltimore, 1889); Oswald Seidensticker, *The First Century of German Printing in America* (Philadelphia, 1893); J. F. Sachse, *German Pictists of Provincial Pennsylvania* (2 vols., ib., 1895); id., *German Sectarians of Pennsylvania, 1708-1800* (2 vols., ib., 1899-1900); Daniel Miller, *Early German-American Newspapers* (Lancaster, Pa., 1911); also Pennsylvania-German Society, *Proceedings* (Philadelphia, 1891 et seq.).

PENNSYLVANIA STATE COLLEGE. A coeducational institution, located at State College, Pa. It was established in 1863 by joint action of the Federal and State governments under the Land Grant Act, although a beginning had been made between 1855 and 1863 under the title The Farmers' High School. The college owns 1200 acres of land, 100 acres of which are set apart for experimental plots and an equal amount, for a campus on which are located 34 college buildings. Forty-one courses of four years each are offered in the six schools of Agriculture, Engineering, Home Economics, Liberal Arts, Mining, and Natural Science. All courses in the School of Liberal Arts lead to the A.B. degree; those in all other schools lead to S.B. Graduate courses are offered leading to the degrees of master of arts and master of science, civil engineer, electrical engineer, engineer of mines, and mechanical engineer. Extension work in agriculture, industrial education, mining institutes, and lyceum courses is conducted throughout the State. Experiment stations are maintained in agriculture, engineering, and mining. In 1914-15 the faculty numbered 261, the four-year students 2017, and the short-course and summer students 1428. There were more than 5000 students in the various correspondence courses. The endowment was \$517,000, the income \$630,739, and the value of the college grounds, buildings, and equipment \$2,167,750. The library contains 67,560 volumes. The president in 1915 was Edwin E. Sparks, LL.D.

PEN'NY (AS. *penig*, *pennig*, *peneg*, *pening*, *pæning*, *pending*, OHG. *phantinc*, *pfentinc*, *pfending*, *phænnig*, Ger. *Pfennig*, *Pfennig*, penny; perhaps connected with OHG. *phant*, *pfant*, Ger. *Pfand*, pawn, pledge, or less plausibly with

OHG. *pfanna*, *phanna*, *panna*, Ger. *Pfanne*, AS. *panne*, Eng. *pan*, from ML. *panna*, from Lat. *patina*, shallow bowl). A British coin and money of account. After the sceattæ (q.v.) it is the most ancient of the English coins, and was the only one generally current among the Anglo-Saxons. The penny is first mentioned in the laws of Ina, King of the West Saxons, about the close of the seventh century. It was at that time a silver coin and weighed about 22½ troy grains, being thus about $\frac{1}{24}$ of the Saxon pound weight. This relation to the pound weight is evidently derived from the usage of the early Franks, who retained the Roman division of the libra into 20 solidi, and the solidus into 12 denarii (the denarius being thus the 240th part of the libra or pound). (See MARK.) Halfpence and farthings were not coined in England till the time of Edward I, but the practice previously prevailed of so deeply indenting the penny with a cross mark that the coin could be easily broken into two or four parts as required. Silver farthings ceased to be coined under Edward VI and silver halfpennies under the Commonwealth. By this time the penny had steadily decreased in weight; it was 18 grains under Edward III, 15 and 12 under Edward IV, 8 under Edward VI, and under Elizabeth it was finally fixed at 7½ grains, or $\frac{1}{16}$ of an ounce of silver, a value to which the subsequent copper pennies, inaugurated in the time of James I (c.1609), which till 1860 were the circulating medium, closely approximated. In 1672 an authorized copper coinage was established and halfpence and farthings were struck in copper. The penny was not introduced till 1797, and at the same period the coinage of twopenny pieces was begun; but these latter, being found unsuitable, were withdrawn. The penny of the present bronze coinage is of only about half the value of the old copper penny. The German pfennig was also originally a silver coin, bearing the same relation to the German pound of silver as the English penny to its pound. And in the twelfth century it was made so broad, in imitation of the Byzantine coins, that it would no longer bear to be struck with a die on each side as before, but was struck on one side only. In the beginning of the fourteenth century the mark of silver was anew divided into 60 parts or coins, which, to distinguish them from the old coins, were called "grossi denarii," whence the term "groschen." In the modern monetary system of Germany the pfennig is a nickel coin, the hundredth of the mark, the latter being equal to a shilling, or about 25 cents. Colloquially in the United States a cent is sometimes referred to as a penny. See CENT; NUMISMATICS.

PENN YAN. A village and the county seat of Yates Co., N. Y., 45 miles north by west of Elmira, on Lake Keuka and on the Pennsylvania and the New York Central railroads (Map: New York, C 5). It has an attractive location at the foot of the lake, the shores being covered with cottages and the hills with vineyards. There are Penn Yan Academy, a Carnegie library, and a fine county courthouse and jail. The village is situated in a noted grape-growing and fruit region and has extensive agricultural and wine-making interests, as well as manufactures of flour, grape baskets (extensive), store fixtures, chemicals, and paper. There are also a large buckwheat mill and a cannery. The manufacturing industries are

promoted by excellent water power derived from the lake. The water works and electric-light plant are owned and operated by the village. Penn Yan was settled about 1800 and was incorporated as a village in 1833. The early settlers were partly Pennsylvanians and partly New Englanders (Yankees); hence the name. Pop., 1900, 4650; 1910, 4597; 1915 (State census), 4725.

PENNYCUICK, pĕn't-kūk or kwik, JOHN (1841-1911). An English engineer. After studying at Cheltenham College and at a military school, he became (1858) a lieutenant in the royal military engineers, served in the Abyssinian campaign in 1867, and for 34 years was connected with the public-works department at Madras, India. He had charge of the construction of the great Periyar Diversion, a huge masonry dam across the upper waters of the Periyar in the territory of Travancore. Pennycuick was made a colonel in 1887, became a member of the engineering faculty at the University of Madras, and until 1899 was president of the Royal Indian Engineering College.

PENNYPACKER, GALUSHA (1844-1916). An American soldier, born in Chester Co., Pa. He received an academic education and on April 22, 1861, enlisted for three months in the Federal service as a quartermaster sergeant in the Ninth Pennsylvania Infantry. On August 22 he reentered the service as a captain in the Ninety-seventh Pennsylvania, served throughout the war, and on Feb. 18, 1865, was commissioned a brigadier general of volunteers. Until April, 1864, he was engaged principally in the operations along the Atlantic coast. He was then transferred to the Army of the James and participated in the action at Drury's Bluff (May 13-16, 1864), where he was wounded, and later led a brigade at the capture of Fort Harrison, where he was again wounded. He recovered in time to participate in the final assault on Fort Fisher (Jan. 15, 1865), but was again wounded, this time so severely that he was confined to the hospital until April, 1866, when he resigned from the service. During this time he received his commission as brigadier general of volunteers and the congressional medal for bravery in battle. The following July he was appointed colonel of the Thirty-fourth regular infantry, and on March 2, 1867, was brevetted major general of the United States army. In 1869 he was transferred to the Sixteenth Infantry, which he commanded until his retirement in 1883. He was made brigadier general of the United States army, retired, in 1904.

PENNYPACKER, SAMUEL WHITAKER (1843-1916). An American politician, born at Phoenixville, Pa. He served as a private in the Twenty-sixth Emergency Regiment at Gettysburg in 1863, in 1866 graduated LL.B. from the University of Pennsylvania, and a year later was president of the Law Academy of Philadelphia. After serving three years as a member of the Board of Public Education of Philadelphia, he was judge of the Court of Common Pleas in 1889-96, presiding judge until 1902, and Republican Governor of Pennsylvania in 1903-07. As Governor his personal character was unassailed, but it was generally considered that he served as a figurehead, while "Boss" Quay (q.v.) ran the government. In 1912 he was a member of the Pennsylvania State Railroad Commission, and then was appointed to the Public Service Commission of the State. Penny-

packer acquired a notable library of early Pennsylvania imprints and became president of the Historical Society of Pennsylvania. His publications include: *Historical and Biographical Sketches* (1883); *Anthony Wayne* (1908); *Pennsylvania in American History* (1910); *The Desecration and Profanation of the Pennsylvania Capitol* (1911); *Pennsylvania, the Keystone: A Short History* (1914).

PENNYROYAL (variant, influenced by popular etymology with *penny*, of obsolete *puliolroyal*, ME. *puliall real*, from ML. *pullium regale*, Lat. *puleium regale*, royal fleabane, from *puleium*, fleabane, from *pulex*, flea, and *regale*, royal, from *rex*, king). In England, *Mentha pulegium*, a species of mint (q.v.). In North America a small plant (*Hedcoma pulegioides*) also bears this name, and having, like the mints, a pleasant aromatic smell and a warm pungent taste, it is used as an infusion in domestic medicine to promote perspiration. The plant is common from New England to the Dakotas and southward. The name is also sometimes applied to *Mentha arvensis canadensis*, which resembles the English pennyroyal (*Mentha pulegium*). The medicinal properties of pennyroyal depend on a volatile oil, a bitter principle, and tannin. It is used largely as a stimulant and in flatulency.

PENOBSCOT. A former leading tribe of the Abnaki confederacy (of the Algonquian stock). They claimed the entire basin of the Penobscot River, Maine, and had their principal village, of the same name, about the present Veazie or Bangor. A French mission was established there in 1688. When first known to the whites the Penobscot, under their chief, Bashaba, seem to have had dominion over all the New England tribes southward to or beyond the Merrimac River. They took active part on the French side in all the Colonial wars on the New England frontier up to 1749, when they made a treaty of peace with the English and have remained quiet ever since. This treaty brought them into disfavor with the Abnaki and other refugees at St. Francis, who continued hostilities in the French interest, for which reason very few of the Penobscot ever joined their emigrant brethren in Canada, but remained in their old homes. For their services on the American side in the Revolution they were confirmed in possession of a small reservation on the Penobscot above Bangor, where they still reside, their principal settlement being Old Town, on an island in the river. They now number 266, still preserving their language and subsisting by hunting, fishing, lumbering, and basket making.

PENOBSCOT BAY. The largest and most important inlet of the Atlantic Ocean indenting the coast of Maine (Map: Maine, D 4). It is about 20 miles wide from Owl's Head to Isle au Haut, and about 28 miles long from this entrance to the mouth of the Penobscot River. The entire indentation is divided into East and West Penobscot bays by a line of large and small islands, the largest of these being North Haven and Vinal Haven.

PENOBSCOT RIVER. The principal river of Maine. It rises on the northwestern boundary of the State and flows east to Lake Chesuncook, then southeast through Pamedumcook Lake at the foot of Mount Katahdin, and finally southward until it empties into the Atlantic Ocean through Penobscot Bay (Map: Maine,

D 4). The total drainage basin comprises 8500 square miles, and about two-thirds of it consists of timberland. The principal tributaries are the Mattawamkeag, which enters the main stream from the east, and the Piscataquis, from the west. Considerable water power is developed from the river, especially for the paper and pulp mills at Old Town, West Enfield, and Millinocket. The river is navigable for about 24 miles to Bangor, which is at the head of tidewater. Consult Barrows and Babb, *Water Resources of the Penobscot River* (Washington, 1912).

PENOL'OGY (from Lat. *pœna*, punishment + Gk. *λογία*, -logia, account, from *λέγειν*, *legein*, to say). A term defined by Dr. F. H. Wines, one of the foremost penologists of the United States, as the treatment of crime for its repression and prevention and of criminals for their extirpation or rehabilitation. The oldest form of the forcible repression of crime and treatment of criminals is execution. The death penalty naturally suggested itself to primitive peoples as the simplest, surest means of ridding society of its dangerous members. With the advance of civilization, however, the number of offenses for which the death penalty is inflicted, has steadily decreased. (See CAPITAL PUNISHMENT.) A later important form of forcible repression is that of transportation, or the establishment of penal colonies, to which criminals are removed. England, Russia, and France have employed this system with more than doubtful success. England, indeed, has abandoned it. (See TRANSPORTATION, PENAL.) A third and later form is the prison. The idea of punishment by imprisonment does not seem to have entered the mind of the rulers of antiquity, although the prison was as a matter of fact, from its crowded and filthy condition, its want of ventilation, the foul fevers and plagues engendered there, and the starvation inflicted upon its hapless inmates, a place of torture and speedy death. It was primarily a place for the sequestration of persons obnoxious to the despotic ruler, as well as of debtors, and for the detention of persons charged with other crimes until they were tried. It is only in comparatively recent times that the prison itself has come to be regarded as a place of punishment, a place for the confinement of condemned persons; and the name "jail" is now generally employed to designate the place where persons under accusation are compelled to abide pending the determination of their guilt or innocence. Of all the institutions of this kind in the United States, the county jails are the most unsatisfactory; they are generally breeding places of crime and licentiousness, because prisoners of all grades, of all ages, and sometimes even of both sexes, are herded together.

The idea of reformation has for a century played an increasingly important part in modern prison systems. In 1773 John Howard, an English country gentleman, having been appointed high sheriff of Bedford, found so many abuses in the jails of his county that he was moved to call the attention of all England to its prisons everywhere. Up to this time the management of jails in England was under no public supervision whatever. It was the custom of the jailer, who was not even paid by the community for the performance of his duties, to collect his fees from the prisoners in his custody. Howard's life was henceforward spent

in attempts to improve the conditions of the prisoner, but his reforms were mainly those which looked to the humane treatment rather than to the reformation of the criminal.

The problem of the restoration of the criminal to society is a later work of the penologist. As to the method of its solution penologists do not all agree. Two distinct systems of prison discipline, which are commonly known as the Pennsylvania, or Philadelphia, and Auburn systems, have grown up in the United States. The first, or separate, system insists upon the separation of prisoners by day and by night; the second, by night only. From these two a third has been evolved, which is in a certain sense a combination of the two but has also distinct features of its own. It is known as the Irish system, because it has been most fully and successfully applied in Ireland, under Sir Walter Crofton.

The essential principle of the separate system is the complete physical separation of prisoners. It rests upon the conviction that mutual contact among them is necessarily corrupting and that classification upon any basis except that of individual character is impossible. At first solitary confinement, without labor or recreation or mental contact with any human being, even with the officers of the prison, except in case of necessity, was the form which this experiment assumed. But the severity of this rule has been relaxed on account of the injury which it wrought in some cases both to the body and the mind of the subject. Now the prisoner is not excluded from a degree of companionship with the prison officials and authorized visitors. The convict, however, sleeps, eats, and works in his cell alone, and takes his exercise in an adjoining space outside. It is claimed for this system that it removes a man from evil associates, trains him as an individual, and increases the personal influence of the authorities and teachers; that it gives greater opportunity for reflection; that the convict who reforms under it cannot afterward be identified by professional criminals and so led back to evil ways; and that discipline may be varied according to the needs of individual convicts. The objections to this system are: that it necessitates a large ground area and costly buildings; that it unfits a man for ordinary methods of work, because he has worked alone and under exceptional conditions such as do not prevail in the outside world where men coöperate; that loneliness is injurious to morals and to mental and physical health. It is claimed, however, that this system has produced excellent results; its friends maintain that, more than any other system, it reduces the number of recidivists, i.e., of discharged convicts who lapse again into crime. The International Prison Congress of 1900 reached the conclusion that this method must be regarded with favor as having checked criminality.

The prison at Auburn, in the State of New York, represents the congregate or silent system, which now prevails throughout the United States. Prisoners sleep in separate cells, but are brought together during the day in large workshops; separation among them, the necessity for which was acknowledged, is secured by a rule forbidding them to communicate with one another or with visitors. The difficulty of enforcing this rule has led to its relaxation. The Eastern Penitentiary in Philadelphia was

intended to be a strictly cellular prison for convicts of the higher grades, but it has long since ceased to be such, because of its seriously overcrowded condition. Among the causes which have contributed to the general adoption of the Auburn system are: the comparative cheapness of construction and maintenance of congregated prisons; the ease with which profitable labor may be introduced into them, especially in connection with machinery of all sorts; the facilities which they afford for contracting out the labor of convicts, thus relieving the administration of financial responsibility.

The Irish system was, in its origin, an outgrowth of the experience of Captain Maconochie as governor of the penal settlement of Norfolk Island. Maconochie devised the mark system, which is added to the ticket-of-leave system, or conditional liberation (also an Australian invention), and the progressive classification and the intermediate prison, to constitute the four elements of the Crofton system. Briefly described, this system consists of four stages, of which the first is not less than eight months of strictly cellular confinement in the Mountjoy Prison, Dublin, with short rations and no employment but picking oakum for the first half of the time. The second is an indefinite period, not less than one year, of associated imprisonment, at Spike Island, where the prisoners are divided into four classes and are promoted from one to another according to their demeanor, labor, and study, an account being kept with them by the use of marks, and their promotion depending upon their record. The third is a short period of probationary detention in a condition intermediate between imprisonment and freedom, at Lusk, where the men are trained for entire freedom, and their capacity for it is tested prior to their liberation. The fourth is conditional liberation with police supervision. This system is supplemented by a scheme for obtaining employment for liberated prisoners.

The first American institution managed along these lines is the Elmira Reformatory (q.v.), opened in 1876 in the State of New York and known as the New York State Reformatory. Prisoners received here are such as are convicted of their first offense for felony, and are held under what is known as the indefinite or indeterminate sentence; i.e., they are not sentenced for a specific period of time, but may be held for the maximum period for which they might have been sentenced for the crime committed, and cannot be discharged until they have served the minimum period provided by statute for such offense. Having served such minimum period, they may be allowed by the board of managers to leave the prison on parole, but must remain while on parole under the control of the board and subject to be taken back to the institution.

Concerning the indeterminate sentence it should be noted that eminent penologists have favored this device on the ground that it is impossible for courts of justice to know just how long a period of incarceration is necessary to produce the desired effect upon an offender. Of two criminals sentenced to 10 years' imprisonment, one may be at the expiration of this period entirely unfit to be released, while the other may have become ready and willing to assume the duties and responsibilities of citizenship. The fixed sentence, it is asserted, is as absurd as it would be for a physician to prescribe medicine for a period of 10 days and then omit to inquire

what effect this treatment has produced in the patient at the expiration thereof. With an indeterminate sentence the prisoner is virtually his own custodian. When he understands this his reformation—assuming him to be a reformable person and not a criminal by instinct—is rendered far more probable. The hope of freedom is the one stimulus to which he may be depended upon to respond. When the criminal is convinced that this hope is to be realized, not through some vague chance of pardon or escape, but whenever by his conduct in prison he makes it apparent to those in charge that society has nothing to fear from him, the work of his reformers is comparatively easy. Most penologists, therefore, see in this almost certain means of securing the cooperation of the criminal, a principle of reform of the greatest importance.

By means of the indeterminate sentence a prisoner may be liberated conditionally, on parole. It is this actual experience with the outside world which establishes a man's powers and intentions. Within the prison walls he cannot steal, or murder, or forge signatures, or otherwise menace the life or property of his fellow man.

The indeterminate sentence has been tried in more than a quarter of the American commonwealths since 1876, but it has met with much opposition from the courts, judges very generally regarding it as an infringement of their prerogative of sentence and finding constitutional objections to it unless the statute creating it is drawn with extreme care to fix a definite period for the expiration of sentence, and in some cases unless the release on parole is specifically described as a commutation for good behavior.

In some of the Western States convicts have been placed at work without guards, on their word of honor that they will not avail themselves of the opportunities to escape. Colorado introduced this honor system as early as 1908. The convicts were placed in camps and put at work building roads; the armed guards were dispensed with. Much more work was performed than formerly under the constant supervision of the prison officials. In four years about 1800 men were put on their honor; though sometimes the camps were 300 miles from the prison, the violations of the pledge amounted to but 1 in 100. In Oregon, on the initiative of Governor West, the honor system has been introduced. Of 450 prisoners under sentence, more than 200 are allowed to go out to work daily, are trusted to do a fair day's work and to return at night. The honor system is applied also to 100 men who are on parole or who have been conditionally pardoned. These men are bound to report once a month or oftener to the authorities. Of those who still remain in the penitentiary, many are given positions of trust and responsibility and are allowed privileges of attending Saturday baseball games, moving pictures, night school, and religious services. Punishments for breaches of faith are loss of privileges, wearing of striped uniforms, etc. The proportion of escapes is approximately the same as when the men were closely guarded. See CRIMINOLOGY; JUVENILE OFFENDERS; PRISONS; PUNISHMENT; RECIDIVISTS; REFORMATORIES.

Bibliography. William Tallack, *Penological and Preventive Principles* (2d ed., London, 1896); August Drähms, *The Criminal* (New York, 1900); C. R. Henderson, *Dependent, De-*

fective, and Delinquent Classes (Boston, 1901); id. (ed.), *Correction and Prevention*, prepared for the Eighth International Prison Congress (4 vols., New York, 1910); F. H. Wines, *Punishment and Reformation* (new ed., ib., 1910); Constantino Bernaldo de Quirós, *Modern Theories of Criminality*, English translation by Alfonso de Salvio (Boston, 1911); E. S. Whitin, *Penal Servitude* (New York, 1912); Gustav Aschaffenburg, *Crime and its Repression* (Eng. trans., Boston, 1913); "Prison Labor," in *Annals of the American Academy of Political and Social Science*, vol. xlv (Philadelphia, 1913); Jenkins and Black (comp.), *Penal Farms and Farm Colonies*, published by the Russell Sage Foundation (New York, 1914).

PENRITH. A market town and urban district of Cumberland, England, in a picturesque and fertile valley, with rich and striking scenery in the vicinity, 18 miles southeast of Carlisle (Map: England, D 2). It has ruins of a fine old castle and in the parish churchyard is a monument of great antiquity known as the Giant's Grave, formed of two pyramidal stones about 12 feet high. The town owns an ancient free grammar school. It is in an agricultural district where sheep and cattle are raised. There are tanneries, saw mills, and breweries; the trade is chiefly agricultural. Pop., 1901, 9180; 1911, 8973.

PENROSE, BOIES (1860-). An American politician, born in Philadelphia. He was educated by private tutors, at the Episcopal Academy, and at Harvard, where he was graduated with honors in 1881. He then studied law in the offices of Wayne MacVeagh (q.v.) and G. T. Bispham, was admitted to the Pennsylvania bar in 1883, and became a member of the Philadelphia firm of Page, Allinson, and Penrose. With the advantage of wealth and old family, he entered Republican politics early, being elected in 1884 to the Lower House of the State Legislature. There he forced recognition from the party leaders by his efforts to secure the passage of the Bullitt Bill reforming the charter of Philadelphia; but, having succeeded, his activity as a reformer apparently ceased. In 1886 he was elected to the State Senate and in 1890 and 1894 was reelected, being chosen President pro tem of that body in 1889 and 1891. In 1897 he was elected to the United States Senate. By this time he had become a controlling factor in State politics and was regarded as the lieutenant and prospective successor of Matthew S. Quay as leader. Reelected Senator in 1903, 1909, and 1914, he served as a member of many important committees and was chairman of those on Post Office and Post Roads, Immigration, and Finance. He was influential in the enactment of the Chinese Exclusion Law. Although rarely speaking on the floor, Penrose was an indefatigable committee worker, and his influence and power in the Senate gradually increased. A regular, identified with the standard element of his party, and a conservative of conservatives, he became the leader of his party in the Senate on the retirement of Senator Aldrich, and soon afterward powerfully aided President Taft in the fight for a reciprocity treaty with Canada. In 1912 a bitter controversy occurred concerning campaign contributions, and his name was prominently and unfavorably associated with the Standard Oil Trust. In the national campaign of that year he was frequently mentioned in the denunciations of

boss rule and machine politics and was sharply criticized as being a boss of the worst type. Such censure, however, had no effect upon his position in Pennsylvania, for in 1914 he was reelected to the Senate over Palmer and Pinchot by an overwhelming plurality. He contributed articles on municipal law and government to the *American and English Encyclopedia of Law*, and with his law partner, Allinson, published a *History of the City Government of Philadelphia* (1887).

PENROSE, FRANCIS CRANMER (1817-1903). An English architect, born at Bracebridge, near Lincoln. He studied under the architect Edward Blore and was graduated at Magdalene College, Cambridge, for which he was traveling bachelor from 1842 until 1845. His *Principles of Athenian Architecture* (1851), a valuable work, was published by the Society of Dilettanti. In 1852 he became surveyor of the fabric of St. Paul's Cathedral, which position he occupied until 1897. He received the royal gold medal of the Institute of British Architects in 1883, and was president of that body in 1894 and 1895. In 1886 he was made director of the British Archaeological School at Athens. Other works by him include *Graphical Method of Predicting Occultations of Stars and Solar Eclipses* (1869) and "Orientation of Greek Temples," in the *Transactions of the Royal Society* (1893-97).

PENRY, JOHN (1559-93). A Puritan writer. He was born in Wales and was graduated B.A. at Cambridge, 1584; M.A., Oxford, 1586. Although always a layman, he was deeply interested in controversial theology on the Puritan side. It is, however, as the moving spirit of the little company of writers and printers who brought out the Martin Marprelate tracts (see MARTIN MARPRELATE CONTROVERSY) that Penry is remembered. The excitement that was caused by these bitter attacks on the alleged evils of the Church of England made it necessary for Penry to seek refuge in Scotland (1590-92). He was well received by the Presbyterian ministers and preached there. In September, 1592, he ventured to return to England and settled in London. The following year he was arrested, brought to trial, and was found guilty of treason. He was hanged on May 29, 1593. Consult his *Life* by Waddington (London, 1854).

PENRYN, pen-rin'. A municipal borough and market town in Cornwall, England, in a richly productive valley bordering on Falmouth harbor, 2 miles northwest of Falmouth (Map: England, A 6). The famous Penryn granite is obtained here; 20,000 tons have been exported in a year. It also manufactures chemicals, fertilizer machinery, lumber, leather, paper, and gunpowder. The rental of corporate property covers all principal expenses, and the town levies no local rates. Its incorporation dates from 1216. Pop., 1901, 3190; 1911, 3092.

PEN'SACOLA. The third city of Florida, a port of entry, and the county seat of Escambia County, 204 miles west of Tallahassee, on several steamship lines and on the Louisville and Nashville, the Gulf, Florida, and Alabama, and the Pensacola, Alabama, and Tennessee railroads (Map: Florida, A 6). Situated on Pensacola Bay about 6 miles from the Gulf of Mexico, it has a landlocked, deep, and commodious harbor, the entrance to which is defended by forts Pickens and McRee. Fort San Carlos, built by the Spanish explorer Don Andres de Arriola in 1696, not far from the site of the present Fort

Barrancas, still stands. Near this fort and connected with it by an underground passage are the ruins of Fort Redoubt, constructed by the Confederate forces. Seven miles from the city is the United States Naval Aeronautic School. Pensacola Bay is the winter rendezvous of the submarine flotilla and the reserve torpedo fleet. Among the city's noteworthy structures are the Pensacola Hospital, the San Carlos Hotel, the laboratory of the State Board of Health, city hall, county courthouse, Blount Building, and the American National Bank Building. Pensacola is chiefly a commercial centre, its fish and lumber interests being particularly important. It has also a considerable trade in coal, cotton, naval stores, grain, etc. The commerce of the port in 1913 included exports valued at \$19,643,000 and imports to the amount of \$1,698,000. Pensacola adopted the commission form of government in 1913. The water works are owned by the city. Pop., 1900, 17,747; 1910, 22,982; 1915 (U. S. est.), 25,742.

Pensacola was settled permanently in 1696 by Spaniards from Vera Cruz. It was captured by the French in 1719, was restored to Spain in 1723, and passed into the hands of the British in 1763. In 1781 it was captured by a Spanish force under Governor Bernardo Galvez. During the War of 1812, owing to the assistance given here to the English, it was taken (1814) by General Jackson, who again in 1818 captured it on account of Spanish encouragement of hostile Indian attacks. The United States took formal possession in 1821, in pursuance of the Treaty of 1819. In 1861 the Confederates seized the navy yard here, but were unable to capture Fort Pickens, and in 1862 they evacuated the city. A destructive fire occurred in Pensacola in 1864.

PENSACOLA BAY. An inlet of the Gulf of Mexico on the coast of Florida near the western boundary of the State (Map: Florida, Insert, A 6). It is about 12½ miles long in an approximately northeast by southwest direction, and its average width is about 2½ miles. Escambia Bay, a considerable body of shoal water bordered by steep bluffs, extends northward from its eastern end, where there is also an eastward extension called East Bay. The entrance to Pensacola Bay is about ¾ mile wide and is obstructed by a bar and shoals through which a channel 30 to 32 feet deep is maintained by dredging. Inside the bay the water is from 4½ to 6½ fathoms deep, up to the city of Pensacola, a distance of about 7½ miles; and the inlet forms one of the best harbors on the Gulf coast.

PEN'SERO'SO, IL (It., the pensive). A poem by Milton, written probably in 1632 at Horton. It is the complement of *L'Allegro* (q.v.) and is an unrivaled description of the impressions made by scenes of nature and the effects of art and music on the mind of a thoughtful, cultivated man.

PENSILE (pén'sil) **NESTS** (from Lat. *pen-silis*, hanging, from *pendere*, to hang). Nests of birds woven in the form of a bag, cup, or hammock, and suspended by the rim from the twigs of a tree, bush, or other plant. Many birds construct such nests, which are not only safer than in most other situations, but usually most skillfully and beautifully made. Prominent American examples are the nests of the Baltimore and orchard orioles, of the vireos, and of certain warblers. In South America the

caciques and some humming birds, in Europe the titmice, and in Asia the tailor birds and weaver birds afford other examples in a great variety of forms and materials. See articles under the names of these birds; and **Plates** under **NIDIFICATION** and **WEAVER BIRD**.

PEN'SION (Lat. *pensio*, payment, weight, from *pendere*, to weigh out). A pension is an annual income granted by public authority, usually for an antecedent public service, military or civil. In earlier days the granting of pensions was a royal prerogative which was frequently abused. At the present time in England civil-list pensions are granted by the free grace of the sovereign and are frequently bestowed upon men of letters. Hereditary pensions granted in former times to national heroes and their descendants have been almost entirely commuted. Pensions are bestowed upon officers of the army and navy and to judges, as in the United States. Like most of the countries of Europe, England has a system of pensions for civil servants. A similar system is widely advocated for the United States. The theory of such pensions is generally that the assured provision for old age is a compensation for the low rates of pay which attach to the government service. In some of the European countries a system of pensioning workmen is now in force. (See **OLD-AGE PENSIONS**.) In the ordinary service of the United States retiring pensions are confined to the Federal judges and the officers of the army and navy. The former at the age of 70, after 10 years of judicial service, may retire on full pay. The maximum pay on the retired list for officers of the army and navy is 75 per cent of the active pay of their respective ranks. Congress has also by special act granted pensions to some of the widows of the Presidents.

Military Pensions in the United States. The system of military pensions in the United States had its germ in the Colonial epoch. The necessity of calling upon the inhabitants for armed defense against the Indians and other foes seemed to impose the necessity of providing at public expense for those who were disabled and for the families of those who perished in the struggles. In the Revolutionary struggle the troops were promised similar pensions, and officers who should remain in the service till the end of the war were promised half pay for life. The Continental Congress was unable to fulfill this obligation. After the adoption of the Constitution Congress took up the matter of pensions and passed in 1792 a general pension law. Successive laws were passed improving the machinery for granting pensions and enlarging the number of claimants, but no increase of rate was granted until 1816, when the rate of a full pension was raised from \$5 per month to \$8. The application of the law was at the same time extended to those who had fought in the War of 1812.

The principle of service pensions was introduced by the Act of March 13, 1818. All survivors of the Revolutionary army or navy who had served until the close of the war, or at any period of the struggle for at least nine months, were entitled, if in needy circumstances, to pensions for life. For privates the rate was fixed at \$8 per month. The law was loosely worded and the door left wide open to fraud. The grants of pensions became a public scandal, and a law of 1820 required all pensioners and applicants to file a statement of property in proof of their

alleged indigence. Many were stricken from the rolls. Up to September, 1822, as many as 18,880 claims had been admitted, but at that time the number of pensioners was only 12,331, owing to the effect of the Law of 1820. In 1832 a law was passed which granted full pay for life to all who had served at least two years in the Revolutionary War, and proportional payments to those who had served less than two years but more than six months.

In 1836 began a long series of acts in favor of the widows of Revolutionary soldiers, restricted at first to those who had married before the close of the Revolution, but gradually growing more liberal until pensions were granted to all, irrespective of the date of marriage.

A similar development of legislation occurred with respect to pensions growing out of the War of 1812 and of the Mexican War. A part of this legislation is of recent date and was affected by the more liberal views as to pension legislation which followed the Civil War.

The first law pensioning soldiers of the Civil War was a disability pension law of July 14, 1862. It provided for the disabled survivor and for the widows, orphan children, and dependent mothers of those who died by reason of any wound received or disease contracted while in the service of the United States and in the line of duty. Rates for total disability ranged from \$8 to \$30 a month, according to rank, and these were the rates accorded to widows. Successive laws beginning July 4, 1864, have increased the rates, adopting fixed rates for various kinds of disability.

A powerful stimulus was given to pensions expenditure by the passage of the Arrears Act in 1879. This provided that all pensions that had been granted or might hereafter be granted should date from the time of disability, provided application were made prior to the first of July, 1880. The operation of the law is shown by the fact that in 1881 the average of first payments to army invalids was \$953.62, and \$1021.51 to army widows.

A bill to establish service pensions for persons in dependent circumstances was vetoed in 1886 by President Cleveland. A similar bill was passed June 27, 1890, providing that all persons who had served 90 days in the war and who were suffering from any mental or physical disability of a permanent character which incapacitated them from performing manual labor may receive pensions of from \$6 to \$12 a month, proportioned to the degree of inability to earn a support. Widows of soldiers who served 90 days, who are dependent upon their daily labor for support, may receive \$8 per month. On March 15, 1904, an executive order, embodied later in the Act of April 24, 1906, was issued that when a claimant had passed the age of 62 he might be regarded as so far incapacitated to perform manual labor as to be entitled to a pension of \$6 a month, if all other legal requirements were properly met; after the age of 70, it may be assumed that the claimant suffers from complete disability and is entitled to \$12 monthly pension. An Act of April 19, 1908, increased the pension to which widows were entitled from \$8 to \$12, and an Act of May 11, 1912, gave pensions varying from \$13 to \$30 a month according to the length of service and the age of the pensioner. The maximum pension of \$30 was given to all survivors of the Mexican War and to all survivors of the Civil War who,

by reason of wounds received or disabilities resulting from service, were unable to perform manual labor.

In addition to the pensions granted under general laws, many claims, often rejected by the Pension Bureau, have been granted by Congress. The provisions of the general pension law were of course applicable to the war with Spain, and this brief struggle has already brought forth a considerable number of pensions. There were on the roll, June 30, 1913, 24,157 Spanish War invalids and 4858 widows and other dependents.

The development of the pension system in the United States can be seen from the following figures taken from the Reports of the Commissioner of Pensions:

YEAR	Number of pensioners	Paid for pensions
1866	126,722	\$15,450,550
1870	198,686	29,351,489
1875	234,821	29,270,407
1880	250,802	56,689,229
1885	345,125	65,171,937
1890	537,944	106,094,250
1892	876,068	139,394,147
1895	970,524	139,807,789
1900	993,529	138,462,131
1905	908,441	141,142,861
1910	921,083	159,974,056
1911	892,098	157,325,160
1912	860,294	152,986,434
1913	820,200	174,171,661
1914	785,239	172,417,546

This table indicates the considerable increase of pension expenditure between 1875 and 1880, due to the Arrears Act. This is brought out more fully by separating the first pension payments from the others, as is done in the following statement:

PENSION PAYMENTS

YEAR	First payments	Payments exclusive of the first
1878	\$2,992,352	\$23,538,439
1880	12,468,191	44,558,803
1883	29,906,754	29,915,481
1889	21,442,349	66,832,764
1890	38,721,866	66,806,314
1892	45,114,168	94,045,188
1896	11,289,278	126,925,483
1900	9,828,525	128,638,005
1905	8,040,064	132,202,797
1909	6,489,416	155,484,288
1910	4,858,504	155,115,552
1911	4,842,925	152,482,235
1912	4,096,502	148,880,032
1913	18,250,225	155,921,436
1914	4,856,614	167,560,932

This statement shows the great increase in first payments immediately following the passage of the Arrears Act and its subsidence until 1890, when the great number of new pensioners increased such payments to a large extent. Our first table showed the rapid increase of the pension roll after 1890. At present we have in fact two systems of pensions—one under the general law and the other under the Law of 1890. Under the general law there were 124,644 on the rolls in 1913 on account of service in the Civil War, and under the Law of 1890, with its modifications of 1908 and 1911, there were 628,169 pensioners.

The Commissioner of Pensions gives in his

report for 1913 the following statement of the aggregate cost of pension expenditure since July 1, 1790:

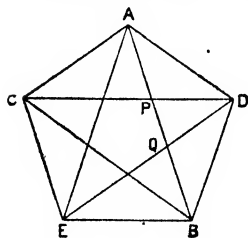
Revolutionary War (estimated).....	\$70,000,000
War of 1812 (service).....	5,923,014
Indian Wars (service).....	12,241,276
War with Mexico (service)....	47,632,572
Civil War.....	4,294,596,944
War with Spain and Philippine Insurrection	42,185,231
Regular Establishment.....	28,461,370
Unclassified.....	16,499,419
	\$4,557,539,824

Consult: *Reports of the Commissioner of Pensions* (Washington, annually); W. H. Glasson, *History of Military Pension Legislation in the United States* (New York, 1900); *Laws of the United States Relating to Army and Navy Pensions* (Washington, 1912); Hopkins and Company, *Manual of Law for the Use of the Enlisted Men of the Army, Navy, and Marine Corps of the United States* (2d ed., ib., 1914). See CHEST, NAVAL; OLD-AGE PENSIONS; TEACHERS' PENSIONS.

PENTACRINUS (Neo-Lat., from Gk. *πέντε*, *pente*, five + *κρίνον*, *krinon*, lily). A genus of stalked crinoids living in the deeper waters of the modern ocean and found fossil in rocks of Triassic to Pliocene age. The calyx is small, with slender arms that branch innumerable times to form a beautiful feathery head. The stem is long, pentangular in section, and provided with numerous prehensile cirri which constitute organs of attachment to various foreign objects. *Pentacrinus* was extremely abundant in the Jurassic seas of Europe, and many slabs bearing numerous fine examples have been obtained from the Liassic rocks of Württemberg. The stems seem to have been of great length, one of them having been traced through many convolutions for about 70 feet. Though so large, the entire structure is extremely delicate. In some cases several individuals of various degrees of development and age have been found attached to pieces of fossil wood, which must have been originally floating logs drifting about the surface of the ocean and supporting the sessile pentacrinids. See CRINOIDEA.

PENTADACTYLON. See TAYGETUS.

PENTAGON (Lat. *pentagonium*, from Gk. *πεντάγωνον*, *pentagōnon*, pentagon, neut. sing. of *πεντάγωνος*, *pentagōnos*, five-cornered, from *πέντε*, *pente*, five + *γωνία*, *gōnia*, angle). A polygon (q.v.) of five sides. A pentagon in the form of a star of five rays is called a *pentagram* (*πέντε*, five, *γραμμή*, line). This figure was used as a



badge by the members of the Pythagorean school, and is said to have symbolized health. In the figure, if A, D, B, E, C, A are connected in order, a regular convex pentagon is formed and the sides of the pentagram become diagonals of the pentagon and divide one another in golden section (q.v.). Whence, in the above illustrated pentagram, Q divides AB and P divides BA in golden section, and the figure may be constructed from this relation.

PENTAGRAM. See PENTAGON.

PENTAMERON (Neo-Lat., from Gk. *πέντε*, *pente*, five + *ἡμέρα*, *hēmera*, day), THE. One

of the best of the *Imaginary Conversations* by Walter Savage Landor (1837). The participants are Petrarch and Boccaccio, who discuss the great Italian writers of the fourteenth century.

PENTAMERUS (Neo-Lat., from Gk. *πενταμερής*, *pentamerēs*, having five parts, from *πέντε*, *pente*, five + *μέρος*, *meros*, part). A group of hinged fossil brachiopods in which the shells are characterized by a more or less distinctly marked division of their interiors into five chambers by radiating septa that arise from the umbonal region. The type of the genus is *Pentamerus oblongus*, an oval to oblong smooth-surfaced shell that is characteristic of the Upper Silurian rocks of North America and Europe. With this typical species have been associated a number of forms that are now recognized as more properly belonging in other genera. Such are: *Gypidula galeata*, a very characteristic species of the Lower Helderberg limestone; *Pentamerella arata*, a strongly plicate shell of the Lower Devonian; *Camerophoria*, an Upper Devonian to Permian genus which strongly resembles the rhynchonellids; and *Capellina*, *Clorinda*, *Amphigena*, *Conchidium*, *Stricklandina*, all of which are important horizon markers in the hands of the expert paleontologist. See PLATE OF BRACHIOPODS.

PENTAMETER (Lat., from Gk. *πέντε*, *pente*, five + *μέτρον*, *metron*, measure). The name of a verse composed of five feet or measures. Its most frequent use is in iambic verse. The iambic pentameter is employed for the dialogue of Greek plays, and in English is used for two of the most popular forms, blank verse and the heroic couplet. In the Spenserian stanza, also, it supplies all verses except the last. The dactylic hexameter in Greek and Latin poetry alternates with the pentameter to make up the common form known as elegiac verse.

PENTATEUCH (Lat. *Pentateuchus*, *Pentateuchum*, from Gk. *πεντάτευχος*, *pentateuchos*, consisting of five books, from *πέντε*, *pente*, five + *τεῦχος*, *teuchos*, tool, case, book roll). A designation of the five books in the Hebrew Bible ascribed by tradition to Moses. It has been suggested that *τεῦχος* refers to the case, sheath, or box in which each roll was kept; but the term *Pentateuch* occurs for the first time in Ptolemy's letter to Flora (Epiphanius, *Haer.* xxxiii, 4), written c.150 A.D., and at that time *τεῦχος* is likely to have meant simply book roll. Tertullian writes *Pentateuchus*. In the Old Testament the work is called *ha-torah* (the law), the book of the law, the law of Moses, the book of Moses, the law of Yahwe, or the law of God. In later times it was sometimes called *hamisha humshe ha-torah* (the five fifths of the law). While it is not known how old the division into five parts is, it certainly antedates the Greek version made in the middle of the third century B.C. The Jews named each book by the opening word, though Numbers was sometimes called "the fifth of musterings" and Deuteronomy "the repetition of the law." The English titles, Genesis, Exodus, Leviticus, Numbers, and Deuteronomy, are derived from the Latin Bible, which took them from the Greek version. Some passages in the Talmud, such as *Shabbath* 115 b, 116 a, mention a division into seven books, but it is not known what its basis was. From the contents it would indeed be natural to divide it into seven parts, viz.: (1) Gen. i-xi; (2) Gen. xii-1; (3) Ex. i-xix. 2; (4) Ex. xix. 3-Num. x. 10; (5) Num. x. 11-xx. 21;

(6) Num. xx. 22-xxxvi. 13; and (7) Deuteronomy.

The Pentateuch gives the impression of unity. There seems to be a definite plan. The different parts relate in natural order the origin of the world and the human race (Gen. i-xi); the family history of the patriarchs (Gen. xii-l); the life of Israel in Goshen, the deliverance from bondage, and the escape (Ex. i-xix. 2), the stay at Sinai and the legislation there (Ex. xix. 3-Num. x. 10); the departure for Kadesh Barnea and the sojourn in that place (Num. x 11-xx. 21); the conquest of the country east of the Dead Sea and the Jordan (Num. xx. 22-xxxvi. 13); and the last exhortations of Moses, his death and burial (Deut i-xxxiv).

Despite its length the story of the sojourn at Sinai and the legislation shows a certain logical arrangement. A covenant between Yahwe and Israel is established on the basis of decalogue and covenant code (Ex xix 3-xxiv. 11), the command is given to construct a sanctuary (Ex xxiv 12-xxxv 18); the bull worship is repudiated (Ex xxxii-xxxiv); the sanctuary is then constructed (Ex xxxv-xl), instructions are given concerning sacrifices (Lev i-vii); priests are consecrated to offer them (Lev. viii-x), various minor codes dealing with the consecration of the people are given (Lev. xi-xvi, xvii-xxvi, xxvii), the holy army is mustered; Levites are elected as assistants and the unclean excluded (Num i-vi 6); offerings are received to pay for the sanctuary, and preparations are made for departure (Num vii-x. 10).

The grouping of the material seems, in the main, to be methodical and not accidental. Inclusion and exclusion, proportion and emphasis, appear to reveal a principle of selection and arrangement. A persistent purpose is evinced by the emphasis on certain thoughts, such as the obligations to keep the Sabbath, to abstain from blood, to practice circumcision, to live a holy family life, and to observe a cult ordained by Yahwe, and the rights of Israel to Canaan, and of each Israelite to a share in the land.

On the other hand, there are divergences of style and language, thought and historic perspective so marked as to deserve the most careful consideration. There are two widely differing accounts of the creation and certain inconsistencies in the story of the flood. Emphasis on the thought is not sufficient to explain the three repetitions (Gen xii, xx, xxvi) of the same story of a patriarch's wife; and the chronology adopted presents peculiar difficulties. The two accounts of Hagar's flight (Gen. xvi, xxi) have the appearance of being duplicates. Different episodes are related to explain the name of Isaac (Gen. xvii, xxi) and of Bethel (Gen. xxviii, xxxv). Jacob is twice renamed (Gen xxxii. 29, xxxv. 10). The story of Judah and Tamar (Gen. xxxviii) breaks the connection of the Joseph story. In the story of Moses there are contradictory statements concerning his immediate ancestry (350 years, Ex vi. 16-20, 400 years, Gen xv 13; 430 years, Ex. xii. 40); his tribe (22,000 Levites, Num iii 39; 23,000, 38 years later, Num xxvi 62, but in his own generation only a few families, Ex vi. 16 ff.); his father-in-law, who is called Reuel in Ex. ii. 18 ff. and Jethro in Ex iii. 1, iv. 18, xviii. 1; and his brother Aaron, who, according to Num. xx. 22, dies in Mount Hor, according to Deut. x 6 in Moshera in Ex. xviii. 13 ff. the plan of appointing judges originates with

Jethro, in Deut. i. 9 ff. with Moses. Yahwe wrote the Decalogue according to Ex. xxxi. 18, Deut. v. 22; Moses wrote it according to Ex. xxxiv. 27. Deut. x. 5 states that Moses made the ark; Ex. xxxvii. 1 that Bezaleel made it. Moses is represented as pitching his tent outside the camp in Ex. xxxiii 7 ff., while in Num. ii 17 it is said to be in the centre of the camp. The statement that at the time of the exodus there were 600,000 armed men in Israel (Ex. xii. 37, Num. xi. 21), strongly supported by the detailed census of the second year giving 603,550 besides 22,000 Levites (Num. i) and that of the fortieth year giving 601,730 besides 23,000 Levites (Num. xxvi), arguing a population of about two millions and a half, places such obstacles in the way of imagining Israel's life in Goshen, the flight from Egypt, and the sojourn in the wilderness, as well as the ministry of Aaron and his two sons to so great a multitude, that it seems to be a later addition to the original story. There is a curious anticipation of the result of the first census (Num i) in Ex xxxviii 26.

The legislative portions of the Pentateuch present very different and contradictory injunctions on many important points. Thus, the Covenant Code (Ex. xx. 23-xxiii. 33) sanctions a multiplicity of shrines, while Deut. xii forbids all sacrifices except at the central sanctuary, the sacrifices and the feasts differ in name, character, and number in different codes, Deuteronomy knows no distinction between Levites and priests, while according to Num. xviii 3 the Levites must not come near the altar lest they die, in Deuteronomy tithes are used for sacrificial banquets and every third year for the relief of the poor, while in Num. xviii 21 ff the tithes are given annually to the Levites, who give a tenth to the priests, in Num. xviii the priests alone have a right to eat of the firstlings, in Deuteronomy they are eaten by the people and the Levites; in Deuteronomy the Levites have no landed property, in Num. xxxv 1 ff 48 cities are assigned to them. There are many repetitions. The Decalogue is given twice (Ex. xx; Deut. v), and again, in a different form, Ex. xxxiv, the dietary laws of Lev. xi are repeated in Deut. xiv. Finally, Joshua is twice designated as Moses' successor (Num. xxvii. 12 ff., Deut. xxxi). These are only a few of the instances. It is difficult to say how far some of these inconsistencies may be owing to textual corruption, but it does not seem probable that even the most radical emendation of the text will ever succeed in concealing the marks, in style and thought, of the composite character of this work.

Belief in the Mosaic authorship of the entire Pentateuch is at least as old as the Chronicles, or the third century B.C. (2 Chron. xxiii 18, xxv 4, xxx 16, xxxiii 8, Ezra iii 2, vi 8, Neh. xiii 1.) How and when it originated cannot be determined. There is no claim in the Pentateuch itself, and Moses is referred to throughout in the third person. Sometimes Moses is spoken of in such a manner as to suggest that it is the testimony of another writer, as e.g.: "this is the Moses who brought Israel out of Egypt" (Ex. vi 26); "the man Moses was great" (Ex. xi 3); "the man Moses was meek above all men on the earth" (Num. xii 3), and "there never arose a prophet again in Israel like Moses" (Deut. xxxiv. 10). Probably the allusions to Moses as the author of some particu-

lar sections led to the notion that he had written the whole work. In Ex. xvii. 14 Moses is told, "Write this in a book"; in Ex. xxiv. 4 we read, "And Moses wrote all the words of Yahwe," probably referring to the Covenant Code; in Ex. xxxiv. 27 Yahwe says, "Write thou these words," and in verse 28 continues, "He wrote upon the tables the words of the covenant, the ten words"; in Num. xxxiii. 2 it is stated, "Moses wrote their goings out according to their journeys"; in Deut. xxx. 9 it is said, "Moses wrote this law," apparently referring to the Deuteronomic law; and in Deut. xxxi. 22, "So Moses wrote this song," referring to Deut. xxxii. The fact that some parts were thus distinctly said to have been written by Moses very naturally raised a presumption that other parts also came from his hand. Similarly the whole Psalter came to be ascribed to David, the whole Book of Proverbs to Solomon, and the two Books of Samuel to Samuel, though other authors besides David and Solomon are mentioned in Psalms and Proverbs, and the larger part of the history in 1 and 2 Samuel belongs to the time after this prophet's death.

The Mosaic authorship is accepted in Ecclus. xxiv. 23, and is presupposed in the Book of Jubilees. The most natural interpretation of the passages in the New Testament referring to "the law of Moses" (Luke xxiv 44), "the book of Moses" (Mark xii. 26), Moses as speaking (Acts xv. 21, 2 Cor. iii. 15), or giving certain laws (Matt xix. 7; Mark vii. 10, Luke xv. 24; John vii. 19; Heb. vii. 14, x. 28; Rom. x. 5, 19), is that the authors regarded the Pentateuch as written by Moses. Philo believed that Moses wrote the account of his own death and burial by way of prophecy (*De Vita Mosis*, ii, 179), and Josephus, who shared this view, gave as the reason that "Moses feared lest, because of his extraordinary virtue, men would say that he had been translated into the realm of the divine" (*Ant.*, iv, 8, 48). According to Baba-bathra 14 b Moses was the author of the Pentateuch, except the last eight verses, which were added by Joshua. This opinion has been held by the synagogue until modern times and is still adhered to by orthodox Jews. It was accepted by the Roman Catholic church also and was ably defended by many of its scholars, though a final decision of the sense in which the Pentateuch is the work of Moses was not reached until the report of the Biblical Commission appeared on June 27, 1906. It maintains that Moses is the author of the Pentateuch, but makes it permissible to believe that he may have used previously existing documents; that there may be post-Mosaic additions; that the Hebrew text has not been preserved in such a manner as to give us assurance that we possess everywhere the original reading; and that, consequently, within certain limits, textual and literary criticism is justifiable. Many Protestant denominations have officially or semiofficially expressed their adherence to the traditional view; but at present there is a tendency to regard the question as open and to allow scholars full freedom to seek for a satisfactory explanation. The defense has aimed at disclosing the weaknesses of the various systems of critical analysis, discovering archaeological evidence favorable to tradition, reconciling alleged inconsistencies, and removing by textual criticism the objections against Mosaic authorship. When the uncertainty of the Masoretic

text is admitted, the original form and extent of the work ascribed to Moses are, even on this standpoint, left in a measure to the idiosyncrasies of subjective judgment.

In 4 Ezra xiv. 21 ff., written c.95 A.D., Ezra is represented as having dictated, in a state of inspiration, not only the Pentateuch but all the 24 books, and also 70 other sacred books. That the lost Pentateuch was restored by Ezra through prophetic inspiration was also the view of Clement of Alexandria, Tertullian, and Chrysostom, while Irenaeus, Basil, Jerome, and Theodoret seem to have thought of an authoritative revision. In certain early Christian circles the conviction existed that the current text contained post-Mosaic additions, as is seen from Ptolemy's letter to Flora, the *Clementine Homilies* (iii, 47), and the testimony concerning the Nazareans by John of Damascus (*Haer.* xix). Celsus appears to have suggested several authors. Abélard expressed to Héloïse his doubts as to the last verses of Deuteronomy. The Bogomiles, who severely criticized the Pentateuch, probably rejected the Mosaic authorship also. Isaac ben Jasos (982-1057) assigned Gen. xxxvi to the time of Jehoshaphat. Ibn Ezra (1088-1167) hinted at additions later than Moses' time in his comments on Deut. i. 1. Carlstadt (1520) thought it a defensible view that Moses was not the author of the Pentateuch, and Luther considered it a matter of indifference. Masius (1574) suggested interpolations in the Pentateuch, and thought that Ezra had some part in the composition. This was also the view of Pereira (1594 ff.), Bonfrère (1625), and Episcopus (1650). Hobbes (1651) maintained that the Pentateuch was post-Mosaic, but that Moses wrote all that is distinctly claimed for him. La Peyrère (1655) suggested diverse authors. Spinoza (1670) regarded the Pentateuch as a part of a great historic work written by Ezra, who used documents of different periods. Richard Simon (1678) suggested the use of memoirs by inspired prophetic archivists of different periods. Le Clerc (1685) thought of private documents rather than public annals, and sought to discover the purpose and plan of the author, whom he conjectured to be the priest of Bethel mentioned in 2 Kings xvii. 24 ff. The view that Moses used earlier documents, that the Pentateuch contains many sections later than his time, and that only those parts distinctly claimed for him can be considered with any degree of assurance as his work, frequently expressed before the eighteenth century, is still held by some scholars. With the growth, however, of the conviction that the story of Moses shows the same composite character as Genesis, that Deut. xii-xxvi, the exhortatory addresses (Deut. i-xi), and the Song of Moses (Deut. xxxii), said to have been written by him, reveal unmistakable signs of a later time, and that the Semitic alphabet was not yet invented at the period to which he is assigned, an increasing number of investigators have been forced to the conclusion that no part of the Pentateuch can have been written by Moses.

To account for the facts which seem to point to a plural authorship various theories have been propounded. The following may be mentioned: (a) *Interpolation Theory*.—Most of the earlier dissenters from the traditional view maintained that, in course of transmission, certain glosses, corrections, or longer interpolations had attached themselves to the Mosaic original.

This theory was held also by apologists like Huet (1679), Bossuet (1679), and Witsius (1692), and was accepted by Le Clerc in 1693. It is held to-day by many Catholic and Protestant scholars, but there is much difference of opinion among them as to the extent of the interpolations. (b) *Fragment Theory*.—La Peyrère and Spinoza looked upon the Pentateuch as a collection of fragments, Astruc also counted a number of such unrelated to the documents he supposed he had discovered. Fulda (1791) thought that fragments were brought together, first in the age of David and afterward by Ezra. The theory was developed by Geddes (1792 ff.), Vater (1802-05), and defended by Hartmann (1831) and Bohlen (1835). (c) *Early Document Theory*.—That actual documents were used by Moses had been suggested by Simon, Le Clerc, Vitranga (1722), and others. But, except in the case of the two accounts of creation, no attempt seems to have been made to separate these sources before Astruc (1753), who used as a clew the difference of the divine names, Elohim and Yahwe. More or less independently, Eichhorn (1779 ff.) reached the same conclusions. Ilgen (1798) ascribed 17 fragments to 3 authors, 1 Elohist, 2 Elohist, and 1 Yahwist. These scholars dealt only with Genesis and Ex. i-ii, and believed that Moses had used the documents discovered. (d) *Supplement Theory*.—Since the framers of the fragment theory had taken into consideration the whole Pentateuch, it was natural that those who rejected it should consider the possibility of a continuance of the Genesis documents in Exodus-Numbers. This was done by Ewald (1831), who proposed to regard the Pentateuch as composed of an Elohist groundwork, supplemented by a Yahwist and brought by an editor into its present shape. Bleek (1836) ascribed the Yahwistic supplements to the editor. This theory was ably presented by Tuch (1838), and was accepted by De Wette (1840), Lengerke (1844), and Delitzsch (1852). Ewald subsequently modified it by assuming four narratives edited by the Yahwist, and in a somewhat different way this view was accepted by Knobel (1861) and Schrader (1869). (e) *Later Document Theory*.—A certain literary unity was secured through the Elohist groundwork, but concerning the elements that attached themselves to it there was no agreement after the simpler form of the supplement theory had been abandoned. Hupfeld's examination of the sources of Genesis (1853), which again led to a division between Ilgen's 1 Elohist, 2 Elohist, and 1 Yahwist, gave the impulse to a definite ascription of Exodus-Numbers also to these three authors. The distinct character of Deuteronomy, already seen by De Wette (1805), was clearly brought out by Riehm (1854). Graf's attempt to separate the legal and historical parts of 1 Elohist, or the Priests' Code, was given up by himself in 1869; and after Colenso's (1862 ff.) criticism of the subject matter Nöldeke (1869) defined more clearly its extent and character. Especially by Wellhausen (1876 ff.) and Kuenen (1877 ff.) the critical analysis into four documents, J, E, D, and P, was presented in such a manner as to win wide approval. Budde (1883) suggested a 2 Yahwist. Though differing as to the age of the documents, Dillmann (1886 ff.) accepted the analysis in the main. Bacon (1893-94) endeavored to separate more sharply J and E. The adherents to this

theory have found it increasingly difficult to maintain the unity of the assumed documents. A tendency has developed to dissolve the sigla J, E, D, and P into symbols representing schools of writers. About twoscore authors of connected history and redactors have been separated, and many more writers of unrelated fragments and independent songs, stories, and minor compends of law have come to light. Passages that once were regarded as typical of P have been claimed as essentially the property of J², as has been recently done regarding Gen. i-ii. 4a by Budde (*Alttestamentliche Zeitschrift*, xxxv, Giessen, 1915). The insistence, especially by Gunkel (cf. *Genesis*, 3d ed., Göttingen, 1910), on discovering the original story-tellers, singers, and legislators, has tended to diminish the importance of J, E, and P, and added to the impression of a movement in the direction of some new theory. (f) *Accretion Theory*.—If the increasing disintegration of the assumed documents tended here and there to undermine confidence in the analytic processes, the implicit reliance upon the Masoretic text, so minutely parceled out by the critics, did not enhance it. The exigencies of the document theory seem to prevent its supporters from applying to the Pentateuch the same canons of textual criticism that they resolutely follow in dealing with other biblical books. A searching criticism, such as that begun by Ilgen, Vater, Pluschke, Frankel, Geiger, and Popper, has been resumed in recent years. From different standpoints and in different ways Klostermann, Hoberg, Redpath, Wiener, Dahse, Eerdmans, Schmidt, and Pope have called attention to the inadequacy of the criteria relied upon, particularly as to the form of the divine name, in view of the various ancient witnesses to the text, but also as to the language and thought. The accretion theory, as it has been called by Schmidt, differs from the fragment theory in not regarding the Pentateuch as an ill-arranged collection of isolated fragments, but as the natural result of the growing together, under the influence of a crystallizing tradition, of originally separate parts, some of them quite extensive, into a fairly well-ordered composition, and a gradual increase of this production by glosses, explanations, duplicates, alterations, and more or less extensive interpolations, often giving a new coloring to the narrative and a new scope to the legal enactment. The object of scientific analysis from the standpoint of this theory is not to find out how the present text, with clews derived from it, may be divided into a series of documents running along parallel lines, but rather to seek, with the ordinary methods of textual and literary criticism, for the earlier forms of a text of which the Masoretic is the last type, and for the manner in which its several parts dealing with different subjects grew together into a connected whole.

According to the biblical chronology the wilderness period falls in the first half of the fifteenth century B.C. The name of the Pharaoh of the oppression is not given, but the references to the store cities Pithom and Raamses naturally led to the assumption that Ramses II, the builder of these cities, was the oppressor of the Hebrews. His date (c.1310-1244 B.C.), however, is at least two centuries too late, while, in view of our present historic knowledge, the intrinsic probability favors the supposition that the Hebrews began to invade Syria in the fif-

teenth century B.C. (See JEWS.) Our earliest approximately datable inscription in the Semitic alphabet may belong to the tenth century, and it is not impossible that its origin goes back to the twelfth (see ALPHABET), but there is no evidence that permits us to assume its existence in the fifteenth. It is extremely hazardous to suppose that the Pentateuch or any part of it was originally composed in hieroglyphics or in cuneiform signs. While the originals of the early legends in Genesis may have been read and copied in cuneiform signs by Amorites in Syria, we have as yet no evidence that Hebrew ever was written in these characters, and the Tell el Amarna letters (q.v.) are written in a Babylonian patois. As long as the so-called priestly writer was supposed to have furnished the groundwork, a comparatively early date was generally assigned to this stratum. But already Gramberg (1829), Reuss (1833), Vatke (1835), and George (1835) assigned Leviticus-Numbers to the exile or the postexilic period, and Graf's position in 1866 was only a modification of this view. Through Kuenen and Wellhausen the postexilic date of the whole Priests' Code became accepted in wide circles, as well as their view that J was older than E. According to the system most in vogue at present, J¹ was written c.850, J² about a century later, E¹ c.750, E² about a century later, D c.620, and the various strata of P between the exile and Ezra. There are still scholars who regard E as earlier than J, and P as preëxilic. The differences have been in a measure composed by the assumption that some elements in E may be older than J and some in J older than E, and that some parts of P may be preëxilic, other parts postexilic. While the Deuteronomic Code is generally supposed to have been written not long before its discovery in 620, there are some who regard it as a product of an earlier age.

In view of the far-reaching changes that the text has clearly undergone in course of time, the tentative and provisional nature of any date suggested must always be borne in mind. Certain peculiarities of the Vulgate indicated by recently collated manuscripts throw a doubt even on the generally accepted thesis that the present consonantal text goes back to the end of the first century A.D., as Hugh Pope has shown. A comparison with the Greek version and the Samaritan recension leaves no doubt that extensive additions and important changes were made after the middle of the third century B.C. The text preserved by the Samaritans seems to be later than that represented by the Greek version and earlier than the Masoretic recension. Whether "the writer of the law of the God of heaven" (Ezra vii. 21) designates Ezra as an author or a mere copyist cannot be determined, but it is a plausible theory that he wrote out a copy of the law more complete than any copy existing before his time, embodying many glosses, corrections, notes, and possibly somewhat extensive additions that had grown up in connection with the reading of the law or developed independently in priestly circles. There seems to be no reason to doubt the essential correctness of the account in 2 Kings xxii-xxiii nor can the substantial identity of Deut. xii-xxvi with Josiah's law book be questioned, despite the differences between his reforms and the letter of the law urged by Kennett. (*Journal of Theological Studies*, Cambridge, 1914.) How the code found in 620 appeared in detail, and when

it was written, may be doubtful. But it seems evident, both from the account itself and from the history recorded in Judges-Kings, that it was absolutely unknown before its discovery, and consequently that a Pentateuch including it could not have existed in the centuries preceding its publication. It was probably provided with the prefatory addresses some time after 620 and appended to Num. x-xxxvi. The story of Moses in Midian and the Sinaitic legislation may go back, in a primitive form, to the age of David and Solomon, though it was later expanded so as to give an Egyptian setting to part of the narrative and to incorporate diverse compends of sacrificial, ritual, and dietary prescriptions, made necessary by the cult in the temple of Solomon, the other sanctuaries, and the temple of Zerubbabel. Some of the legal sections, such as the Covenant Code, may indeed have been formulated as early as the time of the Judges. The similarities to the Code of Hammurapi (q.v.) may be accounted for by the circumstance that through long occupation and cultural influence Babylonian law had to some extent become the common law of the Amorites and the Canaanites, which the invaders would naturally follow as they came into possession of the soil; and local variations and the persistence of tribal customs from the nomadic period would tend to explain the dissimilarities.

There is an advance, as has been pointed out by Söderblom (*Gudströms uppkomst*, Upsala, 1914), from the conceptions of the divinity in the patriarchal stories to that in the Moses story. This would be natural if the former had been already written down, in their simplest form, before the kingdom. The transfer of Amoritic stories concerning the beginnings of things, frankly polytheistic in nature and ultimately of Babylonian origin, would be most readily accounted for in this period also. In any attempt to explain the particular form songs, sagas, and laws assumed, the peculiar character of Jewish thought and its reaction against the environment must always be considered. A vast amount of work remains to be done in the field of Pentateuchal criticism. Of what has been accomplished the most important is the new estimate of Israel's great law book, which recognizes that it reflects a long historic development, that it is a significant effort to solve the riddle of the past and to order a people's life by righteous rules, and that it contains a wealth of valuable suggestions.

Bibliography. For the history of Pentateuchal criticism: A. Westphal, *Les sources du Pentateuque* (3 vols., Paris, 1888-92); H. Holzinger, *Einführung in den Hexateuch* (Freiburg, 1893); C. A. Briggs, *The Higher Criticism of the Hexateuch* (New York, 1897); Carpenter and Harford-Battersby, *Composition of the Hexateuch* (London, 1900); Carl Steuernagel, *Einführung in den Hexateuch* (Göttingen, 1900). For various phases of criticism: Abraham Kuenen, *The Hexateuch* (Eng. trans., London, 1886); Julius Wellhausen, *Die Komposition des Hexateuchs* (3d ed., Berlin, 1899; Eng. trans. of earlier ed., Edinburgh, 1885); Bernhard Luther, in Eduard Meyer, *Die Israeliten* (Halle, 1906); O. Prokisch, *Das nordhebraische Sagenbuch, die Elohimquelle* (Leipzig, 1906); A. H. Klostermann, *Der Pentateuch* (ib., 1907); Adalbert Merx, *Die Bücher Moses und Josia* (Tübingen, 1907); B. D. Eerdmans, *Alttestamentliche Studien*, vols. i-iv (Berlin, 1908-12); Nathaniel

Schmidt, *The Messages of the Poets* (New York, 1911); A. T. Chapman, *Introduction to the Pentateuch* (ib., 1911); H. M. Wiener, *Pentateuchal Studies* (Oberlin, 1912); Johannes Dahse, *Materialien zur Hexateuchfrage* (Giessen, 1912); John Skinner, in *The Expositor* (London, 1913); Nathaniel Schmidt, in *Journal of Biblical Literature* (Boston, 1914-15). For defense of the Mosaic authorship: W. H. Green, *The Higher Criticism of the Pentateuch* (New York, 1895); Gottfried Hoberg, *Moses und der Pentateuch* (Freiburg, 1905); James Orr, *The Problem of the Old Testament* (New York, 1906); Joseph Selbst, in Schuster and Holzammer, *Handbuch zur biblischen Geschichte* (7th ed., Freiburg, 1910); A. J. Maas, "Pentateuch," in *The Catholic Encyclopedia* (New York, 1911); Hugh Pope, "Where Are we in Pentateuchal Criticism?" in *Irish Theological Quarterly*, vol. viii (Dublin, 1913).

PENTATH'LON (Gk. *πένταθλον*, quintuple contest, from *πέντε*, *pente*, five + *ἄθλον*, *athlon*, contest). See OLYMPIC GAMES.

PENTATONIC SCALE. The oldest musical scale, consisting of a progression of whole tones and two minor thirds, as follows: a b d e g. Taking a as the fundamental or central tone, and adding to it the first and second fifths above and below, we can readily see how this, to our ears, strange succession of tones was obtained as a basis for a system of music. Thus

we have g d a e b. For a long time it had been regarded as a peculiar fact that Chinese and Celtic music should rest on this pentatonic scale. But recent investigations have proved that the oldest scale of the Greeks was pentatonic, and that the music of savage nations, irrespective of geographical distribution, rests on this same basis. In their efforts for characterization, some modern composers, especially impressionists, have made considerable use of this old scale.

PENTAUR (Egypt. *Pen-ta-were(t)*). An Egyptian scribe, who was formerly regarded as the author of the poem celebrating the valor of Ramses II in the battle fought against the Hittites at Kadesh on the Orontes. In this character he is the hero of Ebers's novel *Uarda*. It is now known, however, that he was merely the copyist of the papyrus (Sallier 3) in which the poem has been preserved. According to the first Sallier papyrus he was still living in the tenth year of Menephtah. Another Pentaure, who seems to have been a member of the royal family of Egypt, is mentioned in the Turin judiciary papyrus as being concerned in the conspiracy against Ramses III. He was found guilty by the commission appointed to try the case and was forced to kill himself. Consult J. H. Breasted, *A History of the Ancient Egyptians* (New York, 1908).

PENTECOST (OF. *pentecoste*, Fr. *pentecôte*, from Lat. *pentecoste*, from Gk. *πεντηκοστή*, *pentēkostē*, fiftieth, sc. *ἡμέρα*, *hēmera*, day, from *πεντήκοντα*, *pentēkonta*, fifty). The Greek name of the second of the three chief festivals among the Hebrews, in the Old Testament commonly called the Feast of Weeks. It received the name Pentecost from the fact that its celebration was determined by an interval of seven weeks or 50 days from the Passover. (See WEEKS, FEAST OF.) From the Jewish Synagogue it was introduced into the Christian Church and with special solemnity, as being the day of the descent of the Holy Ghost on the Apostles and of the

first solemn preaching of the Christian religion (Acts ii). From early times Pentecost has been regarded as one of the great festivals of the Christian year, and it was chosen as one of the times for the solemn administration of baptism. The English name of the festival, Whitsunday, is derived from the white robes in which the newly baptized were clad. It is regarded as specially sacred to the third person of the Trinity, to whose honor the services of the day are directly addressed. As a trace of its originally agricultural character, the practice prevails in the East as well as in the West of decorating the churches with evergreens and flowers, as is done in England at Christmas, and it is interesting to note also that the whole time intervening between Easter and Pentecost is celebrated in the Roman Catholic church with great solemnity. See PASSOVER.

PENTECOST, GEORGE FREDERICK (1842-). An American Presbyterian clergyman and author, born at Albion, Ill. He left Georgetown College to enter the Union army, in which he served as chaplain (1862-64). He then entered the ministry and between 1864 and 1887 was pastor of churches in Indiana and Kentucky, in Brooklyn and Boston. After evangelical work in Scotland and a special mission to English-speaking Brahmins in India, Dr. Pentecost was (1891-97) pastor of Marylebone Church, London, and (1897-1902) pastor of the First Presbyterian Church of Yonkers, N. Y. In 1902 he was appointed a special commissioner to China, Japan, and the Philippines to examine the missionary work of the Presbyterian and Congregational churches. He wrote: *A South Window* (1886); *Bible Studies* (10 vols., 1880-89); *Out of Egypt* (1884); *Birth and Boyhood of Christ* (1896); *Systematic Benevolence* (1897); *Precious Truths* (1898); *Christian Imperialism* (1902).

PEN'TECOST'AL CHURCH OF THE NAZ'ARENE', generally known as the HOLINESS CHURCH. An American church organization formed in 1907-08 by the union of religious bodies professing particularly the doctrine of entire sanctification of believers by faith, as a work of grace subsequent to and separate from justification. At the time of the union there were in all 230 churches, 575 ministers, and 12,000 communicants. The church conducts home and foreign missions, has a collegiate institute at North Scituate, R. I., and gives theological training in the Deets Pacific Bible College at Los Angeles, Cal., and Bible training in the Bible Institute and Training School at Pilot Point, Tex. The Texas Holiness University at Peniel, Tex., and the Arkansas Holiness College at Vilonia, Ark., are semiofficial institutions of the church. Its official organs are the *Beulah Christian*, Providence, R. I., the *Holiness Evangel*, Pilot Point, Tex., and the *Nazarene Messenger*, Los Angeles, Cal. At the close of 1914 there were reported to be 687 ministers, 708 churches, and 27,526 communicants.

PENTELICON, or **PENTELICUS** (Lat., from Gk. *Πεντελικόν* (sc. *ὄρος*, *mountain*), from *Πεντήλη*, *Pentelē*, name of a deme of Attica). A mountain range in Attica, about 3650 feet high, northeast of Athens, now called Mendeli. From the Persian wars onward quarries of white marble, on its southern side, were used for the chief buildings of Athens and for sculpture. Consult E. A. Gardner, *Ancient Athens* (London, 1902).

PENTHESILE'A (Lat., from Gk. Πενθησίλεια, *Penthesileia*). The daughter of Ares and Queen of the Amazons. In the latter part of the Trojan War she aided Priam and showed great valor. Achilles slew her and, in admiration of her deeds, desired to honor her with a tomb. The ridicule and offensive words of Thersites at this suggestion so provoked Achilles that he killed Thersites, whereupon Diomedes threw the Amazon's body into the Scamander.

PENTHEUS (Lat., from Gk. Πενθεύς). The son of Agave, daughter of Cadmus and successor of Cadmus on the throne of Thebes. He opposed the introduction of the Bacchic worship and, being discovered watching the orgies of the Bacchanals, was torn in pieces by his mother and sisters on Mount Cithæron. The *Bacchæ* of Euripides is based on this legend.

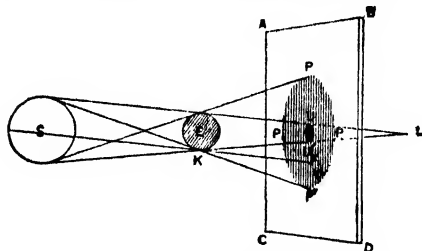
PENTLAND FIRTH. A channel connecting the Atlantic Ocean with the North Sea and separating the Orkney Islands from the mainland of Scotland (Map: Scotland, F 2). It is 14 miles long, 6 to 8 miles wide, and is crossed by a ferry line. Its navigation is dangerous, owing to eddies, rocks, and strong currents, which in the ebb and flow of tides reach a speed of 8 to 10 knots an hour; but it is lighted by several lighthouses and is used by a large number of vessels.

PENTREMITES, pên'trê-mî'têz (Neo-Lat. nom. pl., from Gk. πέντε, *pentê*, five + Lat. *remus*, oar). A genus of fossil echinoderms typical of the class Blastoidea. The Blastoids were crinoid-like animals that lived in abundance in the sea of late Paleozoic time. They resembled the crinoids in respect of the general plan of their organization, but they differed in that the calyx has only 13 principal plates arranged in very regular order, generally forming a bud-shaped head (whence the name), and in the absence of well-developed arms. In place of the arms there were very efficient pinules that screened the food from the water. The calyx is usually small, pear-shaped, ovate, or globose in form and more or less pentangular in section. The stem is seldom found attached to the calyx. About 20 genera and 150 species of blastoids are known, by far the larger proportion of which are American only.

The blastoids appear to have been derived from some of the more regular cystideans of Ordovician time. The earliest member of the group is *Troostocrinus*, an elongate slender species from the Niagara group of Tennessee. *Elacrinus* (*Nucleocrinus*) *vernuculi* is a well-known index fossil of the Lower Devonian limestones of the Central States. The blastoids attained great prominence in the Subcarboniferous of North America, especially in the St. Louis and Kaskaskia limestones of the Mississippi valley. Here the most prominent genus is *Pentremites*, which seems to be unknown in Europe, where it is represented in the Devonian rocks by an ancestral form, *Pentremitidea*. Consult Etheridge and Carpenter, *Catalogue of the Blastoidea in the Geological Department of the British Museum* (London, 1886), containing a full bibliography to the literature of the group, and K. A. von Zittel, *Textbook of Paleontology*, vol. i (Eng. trans. by C. R. Eastman, New York, 1900). See CRINOIDEA; ECHINODERMATA.

PENUM'BRA (Neo-Lat., from Lat. *pene*, *pene*, almost + *umbra*, shadow). When the shadow of an opaque object is thrown upon a surface at some distance from it by a light of

considerable apparent size, it is observed that the shadow is divided into two portions, a dark portion in the centre and a lighter portion surrounding it. The former is known as the *umbra*, or complete shadow; the latter as the *penumbra*, or partial shadow. A reference to the figure will



at once make plain their origin and relation; for if *S* be the illuminating body, *E* the object whose shadow is cast on the surface *ABCD*, it is seen that the small portion *UU'* receives (omitting all consideration of refraction, dispersion, etc., of light) no light from *S*, while the whole surface outside of *PPPP'* is completely illuminated. The point *P'* receives light from the whole of *S*; the point *P* is only half illumined, and that by the lower part of *S*, the illumination of the points becoming less and less as they approach *U'*, which is unillumined. The portion within *UU'* is the umbra, and that between the boundaries *PPPP'* and *UU'* is the penumbra, which, as we have seen, gradually shades from perfect light at the outer boundary to perfect darkness at the inner, so that it is almost impossible exactly to note its limits on either side. This phenomenon, it is evident, can occur only when the illuminating body is of such a size, real or apparent, as to make the angle *P'KU'* of sensible magnitude; and it is equally evident that the nearer the body *E* approaches the plane on which its shadow is cast, the larger is the umbra and the smaller the penumbra; while by increasing the distance between *E* and the plane, so that the point *L* shall fall between them, the umbra is made to vanish and the penumbra is increased. This is well illustrated by natural phenomena; the shadow of a man cast by the sun on the ground presents almost no penumbra; the shadow of the earth thrown by the sun upon space at the distance of the moon gives a penumbra many times as large as the umbra; and sometimes, when the moon is new at her apogee, e.g., her shadow cast upon the earth exhibits no umbra. Spectators on the earth who see a partial eclipse of the sun are situated within the penumbra, but within the umbra when they observe a total eclipse; while if the eclipse be annular, the umbra does not exist in the shadow cast by the moon on the earth's surface. See ECLIPSE.

PENZA, pên'zà. A government of central Russia, consisting of 10 districts and bounded by the Government of Nizhni Novgorod on the north, Simbirsk on the east, Saratov on the south, and Tambov on the west (Map: Russia, F 4). Area, about 15,000 square miles. The surface is undulating, intersected by numerous ravines and sloping towards the northwest. The district is watered principally by the Moksha, a tributary of the Oka, and the Sura, an affluent of the Volga, both navigable. The climate is severe, the mean annual temperature at Penza, the capital, averaging 39°. No

greater contrasts in landscape scenery are found anywhere in central Russia. Agriculture, the chief occupation, is favored by a soil of remarkable fertility. Rye, oats, and wheat are the leading cereals raised. Flax is cultivated to a considerable extent, gardening and stock raising are well developed. Modern farm methods are making some progress among the peasantry. The manufacturing industries employ over 12,000 men, and their products approximate in value \$10,000,000 annually. The chief manufactures are paper, flour, oil, and matches. Pop., 1913, 1,875,700, of whom about 90 per cent were Great Russians and the rest Mordvins and Tatars.

PENZA. The capital of the government of the same name in Russia, at the confluence of the Penza and the Sura, 440 miles by rail southeast of Moscow (Map: Russia, F 4). It is the see of a Greek Catholic bishop, has a monastery and a convent, a mosque, three Gymnasias, a Realschule, a normal school, two seminaries for priests, a technical school, a school of drawing, a medical school, and a picture gallery. The municipality owns the water works and directs a pawnshop. Paper, lumber, flour, and various iron products are the chief manufactures. Penza was founded in 1666. Pop., 1910, 79,552.

PENZANCE, pën-zāns'. A municipal borough, market, and seaport town in Cornwall, England, on the northwest shore of Mount's Bay, 26 miles southwest of Truro (Map: England, A 6). It is the most westerly town in England. The town, exceedingly picturesque in situation, stands on a finely curved shore, surrounded by rocky eminences, is famous for its mild climate, and is much sought as a health resort. Its esplanade, one of the finest in the west of England, commands charming land and sea views. The chief buildings are the town hall and corn market, and the chapels of St. Paul and St. Mary. Its educational institutions include mining and science schools, a geological museum, a school of art, the Free Library, and a public library with rare Cornish books. Woolen yarns and cloths are made, and the fisheries employ upward of 2000 persons. Agricultural produce, pilehards, china clay, granite, tin and copper ores, and vegetables produced in the vicinity are exported; and timber, iron, hemp, and hides are the chief imports. The harbor has two piers, dry docks and wet docks, and a lighthouse. The town owns much remunerative property, wharfs, modern docks, quays, markets, public baths, and water supply. Penzance, meaning "holy head," originated in a chapel to St. Anthony. Edward III gave it the grant of a weekly market, and in the fifteenth century it was described as "a place of ships and merchandise." The Spaniards burned and sacked the town of Penzance in 1595, and the place suffered from Fairfax in the Civil Wars. It enjoyed the privilege of a coinage charter from 1663 to 1838. Pop., 1901, 13,123; 1911, 13,478.

PE'ONAGE. A term used loosely to denote the system of labor formerly prevalent in Spanish America, especially in Mexico. The system originated in the desire of the Spanish government to protect the natives from the rapacity of their conquerors. In Mexico the Indians were early given all the privileges of minors and as such were exempt from compulsory military service, the payment of tithes, aside from a

moderate annual tribute, and certain ecclesiastical and legal restrictions, and the royal officials were especially charged with their protection. These privileges and exemptions, however, served equally well as a mark of inferiority, and their natural protectors often took advantage of their helpless political and social condition to force them into virtual slavery. The labor required of the *peones*, as these Indians were called, was of two kinds: the free labor (*obirajes*), a system under which the laborer served by definite contract, with the days of service, tasks, compensation, etc., strictly regulated by the laws of the Indies; and forced labor, as punishment for crime or debt. With the administration of the law in the hands of corrupt officials, it was comparatively easy to extend almost indefinitely the number of the second class, and with the requirement that each Indian must perform a certain number of days' work each year, the condition of laborers of the first class was far from being one of free contract. During the latter period of the Spanish rule many restrictions were adopted to prevent the Indians from falling into debt, and the conduct of employers was so strictly regulated that the condition of the natives was much better than during the first years of Mexican independence.

The principal evils of the system arose from the strict segregation of the Indians in separate villages, which kept from them any opportunities to advance by more intimate contact with a superior race, and which speedily nullified the first feeble efforts to educate them; and from the feeling of race contempt which their isolated and defenseless condition engendered in their masters. Though in a legal sense the institution itself long since disappeared, the name "peon" is still used to designate the laborer of native or mixed blood, and through his ignorance and credulity many of the worst features of the system are still fastened on him. The system as then prevailing in Mexico survived in New Mexico and Arizona a few years after the annexation of the Southwest to the United States, but was removed by national enactment March 2, 1867. In the early years of the twentieth century investigations of the convict-labor system of the South revealed the fact that at its worst, especially as applied to negro prisoners, it closely paralleled some of the most flagrant evils of early Spanish-American peonage, consequently that term has been used, though not with strict accuracy, to designate the condition of these convicts. Federal grand juries found a number of indictments against convict-labor contractors, and several were convicted. Negroes were arrested on trumped-up or indefinite charges, for vagrancy, etc., and fined; if unable to pay the fine they were sold to the highest bidder for six months or a year. At the expiration of the time of service they were rearrested. These abuses were connected with the system of hiring out convict labor to private contractors. See ALABAMA, *History*.

PE'ONY (OF. *pione*, *pioine*, Fr. *pivoine*, from ML. *peonia*, Lat. *pæonia*, from Gk. *παωνία*, *païōnia*, peony, from *Παών*, *Païōn*, *Παίδν*, *Paran*, the physician of the gods; so called because the plant was originally regarded as medicinal), *Pæonia*. - A genus of plants of the family Ranunculaceæ, natives of southern Europe, northern Africa, and Asia. The species are large, herbaceous or rarely half-shrubby perennials, often with tuberous roots. The half-

shrubby species are known as tree peonies. On account of the beauty of their large flowers, some of the species are extensively cultivated in gardens, and many varieties and hybrids have been originated. The common peony (*Paeonia officinalis*), a native of southern Europe, is the most generally cultivated species. It produces in early summer large solitary blossoms, usually red or crimson, but varying to white. The white peony (*Paeonia albiflora*), another favorite species, with beautiful white or pink and fragrant flowers, is a native of Siberia, where its roots are used by the Mongolian Tatars as a food. These two species are the parents of many cultivated forms. The Chinese peonies, a large group including many hardy double-flowered and fragrant varieties, are hybrids obtained by intercrossing various species. The term "Chinese peony," however, is often applied to several different species. The less common tree peonies are derived mainly from *Paeonia moutan* and *Paeonia lutea*, which latter is a comparatively recent introduction from China and is as yet not so well known as the other species. It begins to blossom in late spring and produces its yellow flowers for about a month. *Paeonia moutan*, the commonest of the tree peonies and much larger than the foregoing, attaining a height of 3 or 4 feet, is a native of California and Japan. It blossoms in spring and produces very large and handsome flowers, representing a wide range of shade and colors. It is often grown as a greenhouse plant for early spring blossoms. The tree peonies prefer a good, strong sandy loam. They require a rich soil, and applications of well-rotted cow manure are very advantageous to the growing plants. They are rather tender and in many localities require protection. The plants are propagated from cuttings at the base, usually made with a piece of the ripened stem, are potted in sandy soil, and placed in a cold frame or in a greenhouse. They are grafted in early fall also on the roots of *Paeonia albiflora* and *Paeonia officinalis*. The shoots for grafting are without a flower bud, and the grafts are potted in sand and kept in cold frames. The herbaceous peonies are commonly increased by divisions of the shoots in autumn or spring. New varieties are grown from seed. Consult L. D. Batchelor, *Classification of the Peony* (Albany, 1911), and C. S. Harrison (ed.), *Manual Giving Complete Directions for the Propagation and Cultivation of the Peony* (3d ed., York, Neb., 1914).

PEOPLE'S CHORAL UNION. See CHORAL SOCIETIES.

PEOPLE'S PALACE. An institution at Mile End, London, established to furnish the people of East London with facilities for education and recreation. In 1840 John B. Beaumont left a sum of money the income of which was to be spent in furnishing education and entertainment for the people in the neighborhood of Beaumont Square. This bequest was badly managed until Sir Edmund Hay Currie took the work in hand and added to the \$60,000 which remained the quarter of a million he had raised for its extension. In 1882 Walter Besant published his story, *All Sorts and Conditions of Men*, describing a "Palace of Delight." This novel suggested the name for the new enterprise, created a wider interest in the work, and emphasized the recreation idea, for the further development of which the means soon offered. Besant, as trustee, was closely connected with

the work. A central location was chosen, and Queen's Hall was formally opened by Queen Victoria on May 14, 1887. Classes in technical studies had already been opened in temporary buildings in October. Other buildings were added gradually. The institution contains, in addition to Queen's Hall, with its large organ and stage and a seating capacity of 4000, a library, classrooms, laboratories, machinery rooms, social rooms, reading rooms, a gymnasium, a swimming tank, and a winter garden. The activities are educational and social. The only religious work is that carried on by voluntarily formed branches of the Young Men's Christian Association. The main object is to furnish boys with a technical training, an opportunity to learn a trade, and wholesome entertainment. The Palace is primarily for the young, membership being limited to persons from 16 to 25 years; a junior section includes those from 13 to 16. There is a small membership fee, for which is received the privilege of attending concerts and other entertainments, the use of the library in the evening, and admission to clubs and classes. The membership the first year was 4200. In 1890 the Drapers Company took the management of the educational work, and two years later they decided to contribute £7000 annually, while the Charities Commission give £3500.

PEOPLE'S PARTY. See FARMERS' ALLIANCE; POPULIST PARTY.

PEORIA. An important manufacturing city and railway centre, the county seat of Peoria Co., Ill., 162 miles by rail southwest of Chicago, on the Illinois River, at the outlet of the expansion called Peoria Lake, and on the Chicago, Burlington, and Quincy, the Chicago and Alton, the Chicago, Peoria, and St. Louis, the Chicago, Rock Island, and Pacific, the Cleveland, Cincinnati, Chicago, and St. Louis, the Chicago and Northwestern, the Illinois Central, the Lake Erie and Western, the Toledo, Peoria, and Western, and other railways (Map: Illinois, E 4). The city covers an area of 9.4 square miles, the residential region being situated on an elevation overlooking the lake, while the business of the city is conducted on the plain bordering the river front. There are many miles of paved streets, an adequate street-railway system, and a thoroughly modern sewerage and drainage plant. The system of public parks and drives is well developed, aggregating about 400 acres. It includes Glen Park (103 acres), Bradley Park (140 acres), the Proctor Recreation Centre, and other parks. Among the city's noteworthy structures and monuments are the Proctor Old Folks' Home, Proctor Hospital, the public library, the law library, the country club, the Crèvecoeur Club, several memorials to soldiers and sailors who died in the Civil War, and the site of Fort Crèvecoeur. Educationally the city is represented by Bradley Polytechnic Institute and Spalding Institute. It is an important commercial centre, controlling a large trade by both rail and river, and in 1909 it ranked second among the cities of the State in the importance of its manufactures. In that year the value of its manufactured products was \$63,061,155 and of the invested capital \$24,945,147. In the 283 manufacturing establishments in that year the total number of persons employed was 7323, of which 5981 were wage earners. The manufacturing establishments include distilleries, glucose works, strawboard mills, wagon works, automo-

bile works, malting houses, breweries, wire-fence works, a peanut-roaster factory, agricultural-implement works, foundries and machine shops, lumber mills of various kinds, and flour mills. In the production of high wines Peoria ranks among the first cities of the United States, the output of its distilleries, according to the census of 1909, being \$45,671,028. A very small amount of whisky is made in Peoria, the high wines being sent to rectifying establishments to be changed into whisky.

The government is vested in a mayor, elected every two years, a council, and administrative officials, who are all, with the exception of the treasurer, city clerk, city attorney, and police magistrate—these being chosen by popular vote—nominated by the executive, subject to the consent of the council. The total revenue receipts in 1913 amounted to \$1,469,995. Peoria spent, in 1912, \$970,601 for maintenance and operation, the principal items being \$357,277 for schools, \$96,967 for the fire department, \$84,981 for the police department, and \$64,193 for municipal lighting. The valuation of all property was assessed in 1912 at \$22,084,481. Pop., 1880, 29,259; 1890, 41,024; 1900, 56,100; 1910, 66,950, including 8810 persons of foreign birth and 1569 negroes; 1914 (U. S. est.), 70,006. In 1902 North Peoria, which had a population of 2358, was annexed to Peoria proper.

In 1680 La Salle visited the site of Peoria and built near here Fort Crèvecoeur, which, however, was soon abandoned. Sometime in the eighteenth century French traders settled here. In 1812 General Craig of the United States army broke up their settlement, suspecting them of assisting the Indians. The present city really dates from 1819. In 1835 Peoria (named from the Peoria Indians) was incorporated as a town, and in 1845 it was chartered as a city. Consult Charles Ballance, *The History of Peoria* (Peoria, 1870), and J. M. Rice, *Peoria, City and County* (2 vols., Chicago, 1912).

PEORIA. One of the five principal tribes of the Illinois Confederacy. Their home territory was in central Illinois, situated about the lake of the same name. In 1832 they and the Kaskaskia tribe removed to Kansas, whence in 1854 they again removed to the reservation in the north-eastern corner of Oklahoma, where they still reside, confederated with the remnant of the Kaskaskia, Wea, and Piankishaw, the entire body numbering only about 180. See ILLINOIS; KASKASKIA.

PEPE, pā'pā, GUGLIELMO, BARON (1783–1855). A Neapolitan soldier, born at Squillace, Calabria. While attending a military school at Naples, he took part in the Republican movement there, fought against the Bourbons, and was exiled to France. Entering Napoleon's army, he was rapidly promoted, commanded a Neapolitan brigade in the Peninsular campaign, and with the rank of general returned in 1813 to Italy. There he served under Murat and later under Ferdinand, but in 1821 he made an unsuccessful attempt to depose the King. Thereafter he lived in exile until the revolutionary outbreaks of 1848, when he returned to Italy and had charge of the defense of Venice against the besieging Austrians. He wrote: *Relations des événements politiques et militaires de Naples en 1820 et 1821* (1822); *Mémoires historiques, politiques, et militaires sur la révolution de Naples* (1823); *Mémoires du général Pepe* (3 vols., 1847); *Histoire des*

révolutions et des guerres d'Italie en 1847, 1848, et 1849 (1850).

PEPERINO, pēp'ēr-ē'nō. See GABII.

PEPI, pā'pē. The name of two kings of Egypt of the sixth dynasty.—**PEPI I**, the greatest monarch of this dynasty, reigned for some 20 years about 2500 B.C. (2590–2570, Breasted). Memorials of him are found throughout Egypt from Elephantine to Tanis as well as in various mines and quarries. An inscription carved on the rocks of the Wādi Maghāra in the peninsula of Sinai records the fact that he sent an expedition thither in the eighteenth year of his reign, and there is other evidence of his military activity. An official named Una, in an inscription found at Abydos, relates that, at the command of King Pepi, he gathered an army, chastised the Bedouins of the Sinaitic Peninsula in several expeditions, and conducted an expedition against a more distant Asiatic country, the name of which has not yet been identified. Pepi was the founder of Memphis (q.v.), which took its name from the King's pyramid Men-no-fer, erected in the vicinity. This pyramid, which is situated near the modern village of Sakkara, was opened in 1881, and its inner walls were found to be covered with religious texts. The successor of Pepi I was his son, Mer-en-rē, and he, dying after a brief reign of four years, was succeeded by his brother **PEPI II**, of whose reign little is known. Breasted gives his dates as 2566–2476 B.C. and adds that it is the longest reign in history. According to the Turin papyrus, he reigned 90 years, while Manetho, who calls him Phiope, states that he reigned for 100 years. His pyramid at Sakkara was opened in 1881; it contains religious texts similar to those found in the other pyramids of this dynasty. Consult: W. M. Flinders Petrie, *A History of Egypt* (3d ed., New York, 1897); E. A. T. Wallis Budge, *A History of Egypt* (ib., 1902); J. H. Breasted, *Ancient Records of Egypt* (Chicago, 1906); id., *A History of the Ancient Egyptians* (New York, 1908).

PEPIN, or **PIPPIN**. The name of three Frankish mayors of the palace, ancestors of the Carolingian kings.—**PEPIN THE ELDER** (died 639), also known as **PEPIN OF LANDEN**, was the first of the name to become prominent. He was major domus of King Dagobert I of the Franks, and, together with his friend Arnulf, Bishop of Metz, controlled the policy of the state. The son of Arnulf was Ansegis, and he married Begga, the daughter of Pepin. Their son was **PEPIN OF HERISTAL** (died 714), who became major domus in the eastern part of the Frankish realm, known as Austrasia, about 679. For several years he waged an unsuccessful war against Ebroin, major domus of Neustria or West Frankland, until in 687 he won a decisive victory at Testry, which gave predominance to Austrasia, the Germanic part of the Frankish country, over Neustria, which on the whole was Celtic. Pepin became the ruler over all the Franks, completely overshadowing the various kings. His natural son was the famous Charles Martel (q.v.).—**PEPIN THE SHORT** (714–768) was King of the Franks from 751 to 768. He was the second son of Charles Martel and hence a grandson of Pepin of Heristal. In 741 he and his brother Carloman received the office of mayors of the palace. In 743 they found it necessary to place a Merovingian, Childeric III, upon the throne which their father had left vacant. For several years

the two brothers ruled conjointly, but in 747 Carloman abdicated and became a monk and later went to Monte Cassino. In 751, supported by the Pope, Pepin was crowned King, thus becoming the first King of the Carolingian dynasty. Childeric was compelled to enter a monastery. In 754 Pepin was made patrician of Rome. Soon after this time he made an expedition into Italy against the Lombards, whom he conquered. The portion of the Exarchate of Ravenna which the latter had seized Pepin gave to the Pope. (See AISTULF.) In the following year he made another expedition against the Lombards, whom he subdued thoroughly, and renewed his gift to the papacy. This is sometimes called the Donation of Pepin (q.v.). Besides overcoming the Lombards, Pepin conquered Aquitaine, took some cities from the Saracens, added Bavaria to his Empire, and began the wars against the Saxons which his son Charles was to wage successfully. Pepin was closely associated with the great missionary Boniface (q.v.) and did much to strengthen the relations between the papacy and the Franks. He died Sept. 24, 768, and was succeeded by his sons Carloman and Charles the Great (q.v.).

Bibliography. Heinrich Hahn, *Jahrbucher des frankischen Reichs* (Berlin, 1863); H. E. Bonnell, *Die Anfänge des karolingischen Hauses* (ib., 1866); Ludwig Oelsner, *Jahrbucher des frankischen Reichs unter König Pepin* (Leipzig, 1871); George Waitz, *Deutsche Verfassungsgeschichte*, vols. ii, iii (Berlin, 1882-83); Engelbert Mühlbacher, *Deutsche Geschichte unter den Karolingern* (Stuttgart, 1896); Thomas Hodgkin, *Italy and her Invaders*, vol. vii (Oxford, 1899); *Cambridge Medieval History*, vol. ii (New York, 1913).

PEPIN, DONATION OF. See DONATION OF PEPIN.

PEPIN, LAKE. An expansion of the Mississippi River, 30 miles below St. Paul (Map: Wisconsin, A 4). It is about 30 miles long, and about 1 to 2 miles wide. The town of Red Wing lies at its north end. The lake is the result of the deposit in the bed of the Mississippi of fluvioglacial drift by the Chippewa River at what is now the lake's lower end. It is surrounded by bluffs of limestone, rising about 400 feet, weatherbeaten into fantastic shapes.

PEPITA JIMÉNEZ, pà-pé'tà hè-mā'náth. A romance by Juan Valera (1874).

PEPO. The ripe seed of a pumpkin, *Cucurbita pepo*, used in medicine as a vermifuge. Its active properties are due to a resin, which may be given in doses of 15 grains; or the pulp of the seeds, rubbed into an emulsion with water after the husks have been removed, may be administered. The drug is a nonpoisonous and efficient anthelmintic.

PEPOLI, pà'pò-lé, GIOACCHINO NAPOLEONE, MARQUIS (1825-81). An Italian statesman, grandson of Murat. He was born at Bologna and married at 19 his cousin, Friederike of Hohenzollern-Sigmaringen. In 1848 he led the National Guards with success against the Austrian troops, and when his native city was taken by the Austrians he fled to Tuscany. In 1859, seven years after his return, he was put at the head of the provisional government of Bologna. After the annexation of the Romagna he entered the Italian Parliament as a member of the Left Centre, was Secretary of Agriculture (1862), and Ambassador to St. Petersburg (1863-64) and to Vienna (1868-70). His close relations

with the Hohenzollerns and Bonapartes were influential in securing recognition and assistance for the Italian kingdom. From 1868 to his death Pepoli was a Senator.

PEPPER (AS. *pipor*, *piper*, from Lat. *piper*, from Gk. *πῖπερ*, *piperi*, *πῖπερ*, *peperi*, pepper, from Skt. *pippala*, long pepper), *Piper*. A genus of plants of the family Piperaceæ (q.v.), with woody stems, solitary spikes opposite to the leaves, and covered with flowers on all sides, the flowers mostly hermaphrodite. The most important species is common pepper or black pepper (*Piper nigrum*), which is a native of the East Indies, cultivated also in many tropical countries and extensively in some parts of the New World, its fruit being the most common and largely used of all spices. It is a rambling and climbing shrub, with smooth and spongy stems, 12 to 20 feet in length, and broadly ovate, acuminate, leathery leaves. The fruit is about the size of a pea, of a bright-red color when ripe, not crowded on the spike. In cultivation the pepper plant is supported by poles or by small trees planted for the purpose. It is propagated by cuttings, comes into bearing in three or four years after it is planted, and yields two crops annually for about 12 years. When any of the berries of a spike begin to change from green to red, all are gathered, as when more fully ripe they are less pungent, besides being apt to drop off. Pepper was known to the ancients; Hippocrates used it as a medicine. In the Middle Ages pepper was one of the most costly spices, and in the thirteenth century a few pounds of it were reckoned a princely present. The black pepper of commerce consists of the dried berries. White pepper is the seed freed from the skin and fleshy part of the fruit, to effect which the dried fruit is soaked in water and then rubbed. Pepper depends for its properties chiefly on an acrid resin and an acrid volatile oil; it contains also a crystalline substance called piperin. The fruit of *Piper tricoicum*, a species very similar to the common pepper, is more pungent and is cultivated in some parts of India. Red pepper is chiefly obtained from species of *Capsicum* (q.v.), especially *Capsicum annuum* and *Capsicum frutescens*, varieties of which are grown in gardens in temperate climates. The larger-fruited sorts, green or ripe, furnish peppers for pickling; while the smaller sorts are used in making chili, capsicum, or cayenne sauce for meats, etc. The culture of red peppers is about the same as for eggplant (q.v.). See FLAVORING PLANTS.

Pepper is used medicinally as an aromatic and a carminative. When applied to the skin it acts as an irritant. Taken internally, it increases slightly the action of the heart and kidneys, and has been thought to possess anti-periodic properties, being formerly given in intermittent fever. Its chief medicinal use is to correct flatulence and prevent intestinal fermentation, and it is therefore a valuable condiment.

Jamaica pepper (or pimento) is a species of *Pimenta*, of the family Myrtaceæ. Guinea pepper and Meleguetta pepper are species of the families Anonaceæ and Zingiberaceæ respectively. See ALLSPICE; ANTHRACNOSE; CAPSICUM; GRAINS OF PARADISE; GUINEA PEPPER.

PEPPER, GEORGE DANA BOARDMAN (1833-1913). An American theologian and educator, born at Ware, Mass. He was graduated from Amherst College in 1857 and in 1860 from New-

ton Theological Institution, where, after five years as a Baptist minister at Waterville, Me., he served as professor of ecclesiastical history until 1867. Subsequently he was professor of systematic theology at Crozer Theological Seminary (1868-82) and in 1882-89 was president of Colby University (now Colby College), where he remained as professor of biblical literature until 1900.

PEPPER, GEORGE WHARTON (1867-). An American lawyer, born in Philadelphia. He was educated at the University of Pennsylvania (A.B., 1887; LL.B., 1889), where he was Algeron Sydney Biddle professor of law from 1893 to 1910, at the same time practicing law. Pepper upheld the university trustees in dismissing Scott Nearing (q.v.). He is author of *The Borderland of Federal and State Decisions* (1889); *Pleading at Common Law and under the Codes* (1891); *The Way* (1909); *A Voice from the Crowd* (1915), Lyman Beecher lectures at Yale; and coauthor of *Pepper and Lewis' New Digest* (1895; 2d ed., 1910).

PEPPER, WILLIAM (1843-98). An American physician and educator, the son of William Pepper. Born and educated in Philadelphia (University of Pennsylvania, M.D., 1864), he settled there and became connected with several hospitals. Although he had a large practice he took much interest in his alma mater, whose faculty he joined in 1868 as lecturer on morbid anatomy. From 1870 to 1876 he was professor of clinical medicine, in the latter year succeeding Alfred Stillé as professor of theory and practice of medicine. This chair he held until 1881, when he was unanimously elected provost of the university. As such he greatly improved the facilities of the university and especially of the medical department. Pepper resigned in 1894. He served as president of the Association of American Physicians in 1891. In 1870 he founded the *Philadelphia Medical Times* (now incorporated in the *New York Medical Journal*), whose editor he was during its first year. He edited the first large American medical system, *Textbook of Theory and Practice of Medicine by American Teachers* (5 vols., 1886-93), and a revised edition of J. F. Meigs's *A Practical Treatise on the Diseases of Children*. Pepper contributed valuable papers to medical literature, afterward reprinted. Among his books may also be mentioned: *Sanitary Relations of Hospitals* (1874); *Higher Medical Education* (1877, 1894); *Syllabus of Notes . . . on the Theory and Practice of Medicine* (1886). Consult F. N. Thorpe, *William Pepper: Biography* (Philadelphia, 1904).

PEPPERBRAND. A disease of cereals. See BUNT.

PEPPERCORN. A disease of wheat. See EARCOCKLES.

PEPPERELL. A town in Middlesex Co., Mass., 35 miles northwest of Boston, on the Nashua River and on the Boston and Maine Railroad (Map: Massachusetts, D 2). It contains the Lawrence Library and the Wolcott Monument. The manufacture of card and paper constitutes the chief industry. Pepperell owns its water works. Pop., 1900, 3701; 1910, 2953.

PEPPER FAMILY. A family of plants. See PIPERACEÆ, and Plate of FLAVORING PLANTS.

PEPPERGRASS (*Lepidium sativum*). A name synonymous with garden cress. See CRESS.

PEPPERIDGE. A North American tree. See BLACK GUM.

PEPPERMINT. A perennial herb. See MINT.

PEPPERRELL, SIR WILLIAM (1696-1759). An American Colonial soldier, born at Kittery, Me. In 1726 he was elected a Representative to the Massachusetts General Court, was next year made a member of the Council, and in 1730, although he had not been educated for the legal profession, he received the appointment of Chief Justice of the Court of Common Pleas. On the breaking out of King George's War (q.v.) he enthusiastically favored the attempt of the New England Colonies to capture the French stronghold of Louisburg on Cape Breton Island and lent £5000 towards equipping the expedition. As a result of his activity and influence he was made commander in chief. Aided by an English squadron under Commodore Warren, he landed his army, numbering about 4000 men, and began the siege of the fortress on the last day of April, 1745. On the seventeenth of the following June the place capitulated. Pepperrell was in 1746 created Baronet by King George II, and while he was on a visit to England in 1749 the city of London presented him with a silver service. When the French and Indian War began (1755), he was active in raising troops, was commissioned a major general in the English army, and commanded the forces defending the frontiers of New England. From 1756 to 1758 he was acting Governor of Massachusetts and in February, 1759, was promoted to the rank of lieutenant general, but died at Kittery in the following July. Pepperrell kept a journal during the Louisburg expedition, and this was edited by C. H. Lincoln and published in the *Proceedings of the American Antiquarian Society* (Worcester, Mass., 1910). He published an account of the *Conference with the Penobscot Tribe* (Boston, 1753). Consult Usher Parsons, *Life of Sir William Pepperrell* (ib., 1855), and Francis Parkman, *A Half-Century of Conflict* (ib., 1892).

PEPPERROOT (*Dentaria diphylla*). A North American perennial herb, of the family Cruciferae, with pairs of ternate leaves, racemes of white flowers, and pungent mustard-flavored roots, used as a condiment.

PEPPER TREE (so called from the pungent drupes), or PEA TREE (*Schinus*). A genus of South American and Mexican trees and shrubs of the family Anacardiaceae. The leaves abound in a resinous or turpentine-like fluid, which is discharged when the leaves become turgid. After rain they fill the air with fragrance, and if thrown into water they jump about as if alive, discharging jets of this peculiar fluid. The twigs also have a strong odor of turpentine. One species, *Schinus molle*, a rapidly growing tree, which attains a considerable size, has been introduced extensively into California. See Plate of POPPY and PEPPER TREE.

PEP'SIN (Fr. *pepsine*, from Gk. *πέψις*, *pepsis*, a cooking, from *πέπρω*, *peptein*, to cook; connected with Lat. *coquere*, Skt. *pac*, to cook). A proteolytic enzyme, an active ferment present in the gastric juice, which has the property of converting the proteid elements of the food into peptones. Pepsin requires for its action the presence of an acid and moderate warmth. As used in medicine it occurs in a fine yellowish-white amorphous powder or in translucent grains or scales. It is extracted from the glandular layer of the stomachs of freshly killed pigs or from the rennet bags of sheep, and should be capable of digesting not less than 3000 times its

own weight of egg albumen. It has, however, been isolated in such a pure form as to be able to digest 25,000 times its own weight of albumen. The use to which it is put is to aid gastric digestion in very old or feeble persons where the gastric juice is deficient. The enzyme does not act on carbohydrates or fats, and is therefore perhaps inferior for general use to pancreatin (q.v.). Pepsin is also used to predigest albuminous foods in the case of invalids with impaired digestive power. Milk is especially valuable when thus modified. See DIGESTION.

PEPTONES. See PROTEINS.

PEPYS, péps, péps, or pép'is, CHARLES CHRISTOPHER, first EARL OF COTTENHAM (1781-1851). An English jurist, born in London. He was educated at Harrow and at Trinity College, Cambridge, and was called to the bar in 1804. In 1830 he was appointed Solicitor-General and in the following year was elected to Parliament. In 1836 he was made Baron Cottenham and Lord Chancellor under the Melbourne administration, and resumed the same post in Lord John Russell's first government. In 1850 he was created Viscount Crowhurst and Earl of Cottenham.

PEPYS, SAMUEL (1633-1703). An English administrator and diarist. He was born Feb. 23, 1633, the son of a London citizen, a tailor, but was in some respects well educated, first at St. Paul's School and afterward at Magdalene College, Cambridge. His cousin, Sir Edward Montagu (later Earl of Sandwich, q.v.), to whom he was for a time secretary, introduced him to public employment. In 1660 he was appointed clerk of the acts of the navy and in 1673 "secretary for the affairs of the navy." He was an excellent public servant, acute, diligent, and laborious; but during the fanatical excitement of the Popish Plot (see OATES, TITUS) he was committed to the Tower on an unfounded charge of aiding in the design to assassinate the King and to extirpate the Protestant religion. Having been discharged without a trial, Pepys was restored to his post in the Admiralty, which he retained till the revolution of 1688. He subsequently suffered a short imprisonment on the charge of being a Jacobite (1689-90). For two years (1684-86) he held the honorable station of president of the Royal Society. He died May 26, 1703. Pepys wrote *Memoirs of the Royal Navy* (1690) and has been credited with *The Portugal History, 1667-68*, by S. P. Esq. (1677). He left to Magdalene College his large collection of books, manuscripts, and prints, including about 2000 ancient English ballads, forming five folio volumes. This curious collection was begun, he says, by Selden, and was continued down to the year 1700, when the form peculiar to the old ballads, viz., the black letter with pictures, was laid aside for the simpler modern fashion. Pepys is now remembered chiefly for his *Diary*, deciphered by the Rev. J. Smith from the original shorthand manuscript in the Pepysian Library, Cambridge, and first published in a mutilated form under the editorial care of Lord Braybrooke in 1825. It begins Jan. 1, 1660, and is continued for about nine years, when the diarist was obliged from defective eyesight to abandon his daily task. As a picture of the court and times of Charles II this *Diary* is invaluable: the events, characters, follies, vices, and peculiarities of the age are presented in true and lively colors. But its perennial appeal will be as a revelation of the character of the author—capa-

ble public man, lover of society, domestic in his tastes, though not consistently so, vain as a peacock, overproud of his accomplishments, anxious for the favor of the great, pleased with every new pleasure, a man of the world, a snob, a child, and lovable withal. The *Diary*, racy yet quaintly naive, is, all in all, one of the most diverting books in the language. Although it seems incredible that Pepys could have desired so candid a self-portrait to be exhibited to the whole world, yet perhaps he was too genuinely the egoist to dread publicity (especially posthumous), even of his foibles, his faults, and his sins. It has often been printed, but all the editions are fragmentary except that by Wheatley in eight volumes (London, 1893 et seq.), which is accurate and complete except for the omission of a few of the most offensive passages. Wheatley added to his edition a volume of *Pepysiana* (1899). The same editor has also published *Samuel Pepys and the World he Lived in* (London, 1880). Some hitherto unpublished letters of Pepys are to be found in the *Athenæum*, vol. xc (ib., 1887), and the *Academy*, vol. xxxviii (ib., 1890). Consult also: Tanner, "Pepys and the Popish Plot," in the *English Historical Review*, vol. vii (ib., 1892); R. L. Stevenson, "Samuel Pepys," in *Familiar Studies* (ib., 1892); Percy Lubbock, *Samuel Pepys* (ib., 1909); E. H. Moorhouse, *Samuel Pepys, Administrator, Observer, Gossip* (ib., 1909).

PEQUOT (from *Paquatanog*, destroyers). A warlike Algonquian tribe formerly occupying the coast region of eastern Connecticut from the Rhode Island border westward to beyond the Thames. They were originally a part of the Mohegan (q.v.) of the Connecticut River, and appear to have acquired their later name by their successful invasion of the coast country until then held by the Niantic (q.v.). The two tribes continued to be one people until the succession of Sassacus about the time of the English settlement, when a younger chief, Uncas, seceded with his party, who thenceforth acted as a distinct tribe, retaining the old name of Mohegan. At the period of their greatest strength the Pequot probably numbered at least 3000. By the murder in July, 1636, of a trader, John Oldham, who had maltreated them, the Pequot became involved in a war with the English in 1637. On May 26 (O. S.), 1637, their principal fort, near Mystic River, was surprised and set on fire by a company of about 90 whites, under Capt. John Mason (q.v.), aided by a small force of Indians, and probably 600 Pequot men, women, and children perished in the flames or were shot down while trying to escape. The loss of the English was only two. The tribe was so crippled by the terrible slaughter that after a few desperate but unsuccessful efforts at resistance they determined to separate into small parties and abandon their country. The principal body, headed by Sassacus, attempted to escape to the Mohawk, but was intercepted and nearly every person was either killed or captured. The few who escaped to the Mohawk, including Sassacus himself, were killed by that tribe. Scattered fugitives were shot down wherever found until the few survivors at last came in and asked for mercy at the hands of the English. All prisoners taken had been sold into slavery, many to the West Indies, and those who now surrendered were distributed among the other neighboring tribes and forbidden any longer to call themselves Pequot. The Pequot

given to the Indian allies of the colonists were treated so harshly by their masters that it was finally necessary in 1655 to gather them into two villages in their old country and place them under direct control of the Colonial government. Here they numbered about 1500 in 1674. They decreased rapidly, as did the other tribes, and in 1762 the remnant numbered only 140, who in 1832 had dwindled to 40, but in 1910 they numbered 66.

PERA, pā'rá. The foreigners' quarter in Constantinople (q.v.).

PERACAMPOS, pā'rá-kām'pós, DON JUAN VAN HALEN, COUNT OF. See HALEN, or HALEM.

PERÆ'A (Lat., from Gk. Περαια, *Peraia*, from περαιος, *peraios*, beyond, from πέρας, *peran*, on the other side). A part of Palestine, east of the river Jordan, anciently belonging to the tribes of Reuben and Gad (Map: Palestine, D 4). Josephus (*Bel. Jud.*, iii, 3, 3) bounds it on the north by Pella, east by Philadelphia, south by the castle of Machærus, and west by the Jordan. Elsewhere (*ib.*, iv, 7, 3 and 6) he names Gadara as the capital. It is probable, however, that Peræa extended as far north as the Yarmuk and south to the Arnon. The district is a high table-land, cut up by deep watercourses. It is naturally a fertile region, provides good pasturage, and the olive and the vine flourish there. In the earlier days of the Maccabees it was inhabited chiefly by Gentiles, but by the beginning of the Christian era the population had become prevaillingly Jewish, and Peræa sent a multitude of Jews to Jerusalem in the uprising against Sabinus. Peræa was the scene of a part of the ministries of John the Baptist and of Jesus, who, according to John x. 40, appears to have been baptized there, and from Peræa he made his last journey to Jerusalem. See BASHAN; GILEAD; PALESTINE.

PERAK, pā-rik'. The most northerly of the Federated Malay States (q.v.), situated on the western coast of the Malay Peninsula, bounded by Kedah and Patani on the north, Kelantan and Pahang on the east, Selangor on the south, and the Strait of Malacca on the west (Map: Burma, Siam, etc., D 6). It also touches Province Wellesley and the Dindings Territory. Its area is estimated at about 7800 square miles. The region is traversed from northeast to southwest by two parallel mountain ranges inclosing the valley of the Perak River. The mountains are highly mineralized. Those on the Pahang boundary, which are part of the main range of the peninsula, reach a height of over 7000 feet, the highest being Gunong Kerbau, 7160 feet. There are a number of rivers besides the Perak and its tributaries, but they are mostly unimportant for navigation. The climate is characterized by intense humidity and is unhealthful for Europeans. The chief mineral is tin, which is mined principally in the districts of Kinta, Larut, Badang Padang, and Klian Intan. Employees in the tin mines are mostly Chinese. Besides tin Perak has also deposits of gold, silver, iron, lead, copper, arsenic, zinc, manganese, bismuth, etc. Agriculture plays only a secondary part, and a large portion of the region is still covered with forests. The agricultural population is chiefly Malay. Important agricultural products are rice, sugar, coconuts, and rubber. Perak has greatly increased in commercial importance since the establishment of the British protectorate. Imports and exports were valued at 14,741,148 and 29,190,-

663 Straits Settlements dollars, respectively, in 1900; in 1905, 20,153,242 and 41,187,506; in 1910, 21,784,361 and 44,084,758; in 1913, 34,286,777 and 71,402,985. (See FOREIGN MONEY.) Tin ore and, especially in recent years, rubber are by far the largest exports. The exports of tin ore and tin amounted to 35,501,981 dollars in 1905, 32,686,972 in 1910, and 49,082,938 in 1913. The rubber export increased in value from 126,812 dollars in 1905 to 7,757,432 in 1910 and 18,326,505 in 1913. The only other large exports in 1913 were: copra, 1,417,118 dollars; rice, 1,018,279; paddy, 538,341. The sugar export declined from 2,181,974 dollars in 1905 to 674,197 in 1910 and 6511 in 1913. Southeast from the Province Wellesley boundary the state is traversed by the main line of the railway that connects Prai (opposite Penang) and Johore Bharu (opposite Singapore). Revenue and expenditure in 1910, 14,229,789 and 12,060,565 dollars respectively; in 1913, 23,970,058 and 25,804,040. The population of the state in 1901 was 329,665, including about 150,000 Chinese, 142,000 Malays, 35,000 Tamils, etc., 8000 aboriginals, and 700 whites. The 1911 census returned a population of 494,057, of whom 344,238 were males and 149,819 females; estimate of Dec. 31, 1913, 531,037. The chief towns are Ipoh, Taiping, Kuala Kangsar, Tapah, and Kampar; the chief port is Teluk Anson. Taiping is the capital. The first European settlement in Perak was established in 1650 by the Dutch, who were expelled by the British in 1795. In 1818 Perak fell under the rule of the Siamese, but it regained its independence with the assistance of the British in 1824, and was governed by its own sultans until 1874, when internal dissensions brought about British interference and the appointment of a British resident, who was soon murdered. British authority was reestablished by means of a punitive expedition, and no further manifestation of resistance to British protection has occurred. The discovery of tin about 1850 was followed by the immigration of Chinese in great numbers. The Anglo-Siamese Treaty of 1909 transferred from Patani to Perak about 1000 square miles of territory (population at that time about 3000). This territory, lying east of Kedah, contains the tin mines of Klian Intan. See FEDERATED MALAY STATES. Consult McNair, *Perak and the Malays* (London, 1878), and Wright and Reed, *The Malay Peninsula* (*ib.*, 1912).

PERAMBULATION OF PARISHES. An ancient custom conducted with much ceremony before the Reformation in England. It took place on one of the Rogation Days (q.v.). The clergy, the lord of the manor, and many other persons walked in procession all around the boundaries of the parishes, returning to the church for prayer. The ceremonies were much curtailed at the Reformation, but the custom continued and, on the plea of immemorial custom, has often afforded evidence in cases of disputed boundary. The origin of the custom has been referred to the Roman festivals of Terminalia and Ambarvalia. For the customs, consult Chambers, *The Book of Days*, under May 2 (London, 2d ed., 1906).

PER CAPITA (Lat., according to heads or individuals). A term derived from the civil or Roman law, employed in the law of succession to denote that the persons upon whom property devolves by inheritance or devise are entitled

to take equal individual shares in their own right and not as a group representing a parent or other ancestor. In most jurisdictions descendants in an equal degree of relationship to a common ancestor take per capita, i.e., each has an equal right, the estate being divided among them in equal shares. Thus, if a person dies leaving children or, there being no children, leaving several brothers and sisters, the children in the one case, the brothers and sisters in the other case, inherit equal shares in the decedent's estate, i.e., they take as independent individuals—per capita. But if one dies leaving a son and several grandchildren, the issue of another (deceased) child, the grandchildren take as a group only their parents' share. In that case they are said to take per stirpes (Lat., according to stocks), i.e., as a group representing their deceased parent. The manner of succession and descent is largely regulated by statute in the various States. See DESCENT; DISTRIBUTION; SUCCESSION.

PERCEFORÊT, pâr's'fô'râ' (Fr., pierce-forest). A French romance giving the fabled history of Britain before the days of King Arthur and first printed in Paris in 1528. The time of its production is uncertain, but was probably the latter part of the thirteenth century. The writer hints that the romance was taken from a manuscript found in an English monastery in 1286. The hero, King Perceforêt, so called from his conquest of an enchanted forest, came to Britain with Alexander the Great, after the royal line of Brut was extinct, and in fulfillment of an oracle was made King. Unlike most romances of chivalry, it deals with enchantments, dreams, and visions rather than with battles and tournaments. In its day it was the most popular romance of its class, and is now valuable for its descriptions of mediæval life and manners.

PERCEPTION. Essentially, a sensory experience which is meaningful and in which sensory elements are so incorporated into a group as to give the impression of a single and unitary whole. When we perceive an external object, e.g., a tree, the experience comes to us as a whole, with the meaning of "that tree." Since perception thus involves meaning (q.v.), it is a term common to both psychology and epistemology. The questions how, in general, we acquire knowledge of an external world and what is the validity of this knowledge when attained, are questions that lie beyond the psychological sphere. Within psychology perception is regarded either as a specific mode of mental function, in which case its meaningful character is emphasized, or as a complex of mental processes, in which case emphasis is laid on its pattern or arrangement.

Functional psychologists are practically agreed as to the cognitive nature of perception, though some regard it as a stage of cognitive process and others make it synonymous with cognition. They do not agree, however, whether it is capable of further analysis. Ward, e.g., regards the percept or intuition as an integration or synthesis of approximately elementary presentations, while James thinks of it as something quite single and unitary. Stout occupies an intermediate position; perceptions, he thinks, are single and unitary, but "the distinctionless unity of the whole tends to pass into multiplicity as the mind dwells on it."

The problem of perception, taken structurally,

is (1) to resolve the complex into its elements; (2) to single out those elements which form, as it were, the nucleus of the perception from those which furnish the context, the vehicle of its meaning; (3) to describe the pattern or mode in which the various elements are incorporated into the group; and (4) to discover the physiological conditions which underlie the particular grouping. The problem thus outlined is difficult, principally because our perceptive patterns are very old, far older indeed than man himself. We are born with dispositions to take the world perceptively, to see objects as far or near, here or there, stationary or moving. We may hardly hope to discover what the perceptive patterns were in their original form; for mental processes which once were present have dropped out and nervous sets or brain habits have taken their place. How far psychology has succeeded in its attack upon the problem can best be learned from a study of separate perceptions. (See DISTANCE OR DEPTH; LOCALITY; MOVEMENT; RHYTHM; ETC.) In general we may say that every perception may be resolved into the two factors suggested above, the one peripheral or sensory, the other central or nervous. The latter includes not only imaginal processes (see IMAGE), which may in fact be traced in many though not in all perceptions, but also nervous predispositions or brain habits. (See DISPOSITION.) The peripheral factor, together with the imaginal contents, furnishes the elements of which the perception is composed. The brain habit determines the pattern of the grouping, the mold, as it were, into which the elements are run. In qualitative perceptions, such as that of lemonade, which resolves into sweet, sour, cold, pressure, an odor, etc., the peripheral is the more important factor; the various qualities so blend or merge into one another as to give the impression of a single whole without losing their qualitative individuality. Brain habits, on the other hand, seem to be essential in spatial perceptions. The sensory elements are here conjoined rather than blended, and they serve mainly as clues for touching off the disposition to regard the object as spatial. For illustration of the effect of brain habit in visual perceptions of space, see ILLUSION.

Some psychologists believe that, in the synthesis of the component parts of a perception, a new and unique quality appears as a result of the form of combination. A melody, they urge, is something more than a succession of tones which vary in pitch relation, duration, and intensity; it is melodic; and melodiousness is a new element, a form quality; no description of a perception is complete which leaves it out of account. The new element, however, is not required. It is a matter of experience that a perception is something more than a mere sum or collection of sensations and images; the pattern or mode of incorporation is also essential. Every type of perception, therefore, has its singularity, something formal which may be regarded as a mark or characteristic of that type. In so far we may admit the existence of form quality; but that is not to say that we have found a new mental element; for then the form quality would remain over, would be left on our hands, after our analysis of perception had been otherwise completed, and this is not the case. The facts are met if we remember that the constituent processes in perception

are cast in a genetic mold which shapes or arranges them in some typical way.

Bibliography. William James, *Principles of Psychology* (New York, 1905); G. F. Stout, *Analytic Psychology* (3d ed., 2 vols., London, 1909); Oswald Külpe, *Outlines of Psychology* (ib., 1909); W. M. Wundt, *Physiologische Psychologie* (8th ed., Leipzig, 1910-11; Eng. trans. of 5th Ger. ed., New York, 1905); W. H. Winch, *Children's Perceptions* (Baltimore, 1914); C. D. Broad, *Perceptions, Physics, and Reality* (New York, 1914); works on normal psychology in general.

PERCEPTION OF DISTANCE OR DEPTH. See DISTANCE OR DEPTH, PERCEPTION OF.

PERCEPTION OF FIGURE AND FORM. See FIGURE, PERCEPTION OF.

PERCEPTION OF LOCALITY. See LOCALITY, PERCEPTION OF.

PERCEPTION OF SPACE. See VISION.

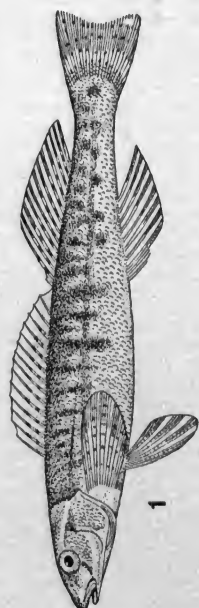
PERCEVAL, pĕr'si-val. The hero of one of the most famous and widespread legends in the Arthurian cycle. Speaking with the uncertainty which always attaches to any attempt to determine positively the history of these legends, it may be held that the version of the Grail story in which Perceval is the hero is earlier than that in which Galahad holds this place. Those scholars who maintain the theory of a Welsh origin for the whole cycle attempt with determination to identify Perceval with the Peredur of the *Mabinogion* and other Welsh legends; but it is only by straining a possible allusion that any reference to the Grail can be found in them. This feature becomes of prime importance in the romance of *Perceval le Gallois*, begun by Chrestien de Troyes (q.v.), continued by Gauchier de Denain, and finished by Menneceier and Gerbert in the closing years of the twelfth century. This French version was taken by the great German poet Wolfram von Eschenbach and adapted rather than translated. In his *Parzival*, the work of his highest genius, rendered additionally famous from its selection by Wagner as the basis of a libretto, we get farther away from the Arthurian legend proper into regions of Germanic mysticism. Yet, though there are defects of dramatic structure in Wolfram's treatment as a whole, and though we find ourselves in a strange country and the Grail mountain, Montsalvatsch, is altogether in fairyland, there is in him something higher and larger and more human than in the Western versions. For the Welsh theory, consult Sir John Rhys, *Studies in the Arthurian Legend* (Oxford, 1891); for Chrestien's romance, the edition by Foerster, *Percevals li galois* (Freiburg, 1909); for Wolfram von Eschenbach, Wilhelm Hertz, *Parzival* (Stuttgart, 1898), which contains good notes and a rich bibliography, and a rendering in English verse by J. L. Weston (London, 1894). Other aspects of the subject are treated in Hoffmann, *Die Quellen des Didot Perceval* (Halle, 1905); R. H. Griffith, *Sir Perceval of Galles: A Study of the Sources of the Legend* (Chicago, 1911); Campion and Holthausen, *Sir Perceval of Gales* (Heidelberg, 1913); Ward and Waller, in *The Cambridge History of English Literature*, vol. i (New York, 1907). See GRAIL; and, for the Wagner treatment, PARSIFAL.

PERCEVAL, SPENCER (1762-1812). An English statesman, born in London, Nov. 1, 1762. He was the second son of John, Earl of Egmont,

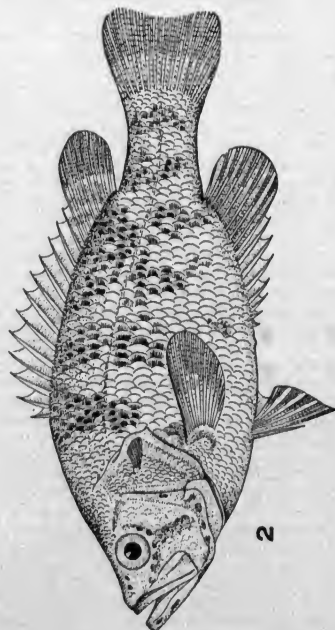
was educated at Harrow and at Trinity College, Cambridge, and was called to the bar at Lincoln's Inn in 1786. A clever pamphlet on the abatement of the impeachment of Warren Hastings made him favorably known to Pitt. Obtaining a seat in Parliament for Northampton in 1796, he supported Pitt in his policy of war with France and of a strong rule at home. In the Addington administration he was made Solicitor-General in 1801 and Attorney-General in 1802. In 1807 he abandoned the legal profession to accept the post of Chancellor of the Exchequer under Portland. In this position he conceived and drafted the Orders in Council, which became extremely unpopular. His well-known opposition to Catholic emancipation assured him the favor of George III. He was in fact the real head of the government, and on the death of the Duke of Portland in 1809 Perceval himself became Prime Minister, uniting to his office of Chancellor of the Exchequer that of First Lord of the Treasury. He was retained in power by the Prince of Wales on his accession to the regency. On May, 1812, as Perceval was entering the lobby of the House of Commons, he was shot and killed by a Liverpool broker named Bellingham, who believed that losses he had sustained while in Russia were the fault of the government. Consult: C. V. Williams, *Life and Administration of the Right Honorable Spencer Perceval* (London, 1856); Sir Spencer Walpole, *Life of Spencer Perceval*, including his correspondence (ib., 1874); Philip Treherne, . . . *Spencer Perceval* (ib., 1909).

PERCH (OF., Fr. *perche*, from Lat. *perca*, from Gk. *πέρκη*, *perkē*, perch; connected with *περκνός*, *perknos*, Skt. *prñi*, spotted). The name rather loosely applied to a large number of fishes having a perciform body. These often belong to very different families. The true perches belong to the family Percidae and are all fresh-water fishes. In this family the body is elongated, either compressed or cylindrical, and covered with rather small ctenoid scales. There are two dorsals, usually quite distinct, the anterior spinous, and with 6 to 15 spines, and the anal with 1 or 2 spines. The air bladder is small or entirely wanting. Perches are usually considered typical spiny-rayed fishes. There are about 20 genera and 125 species. They are distributed in the cooler regions of the Northern Hemisphere, the majority of the species being confined to eastern North America. The typical perches (genus *Perca*) contain the well-known yellow perches of Europe, Asia, and America, which closely resemble one another. The American species (*Perca flavescens*) is a fish well known to all anglers, abounding in the lakes and streams of all the eastern half of the country, as far north as the St. Lawrence River and Nova Scotia. It reaches the length of 1 foot, is gamy, and admirable for eating. Its back is olivaceous in color, the sides golden yellow, with six or eight broad dark bars, and the lower fins orange red. It spawns in late winter and early spring, laying eggs in zigzag hollow strings from 2 to 7 feet long. These fish are carnivorous and feed largely on smaller fishes, including the fry of some more valuable than themselves. They are extremely numerous in the Great Lakes, where they are caught near shore in seines and gill nets in vast quantities and shipped to interior markets to the value of about \$300,000 annually. Other local names are

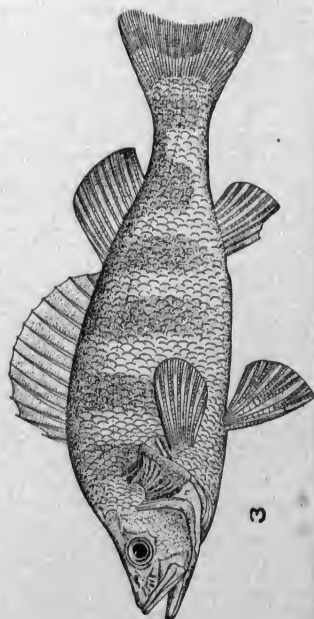
PERCHES OF NORTH AMERICA



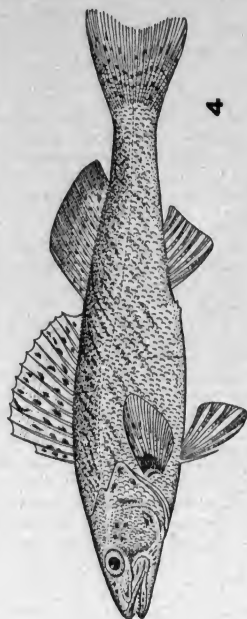
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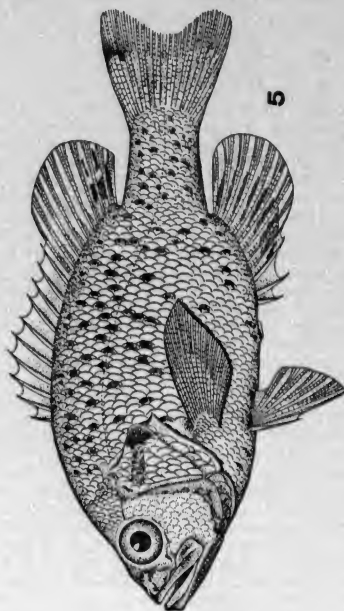
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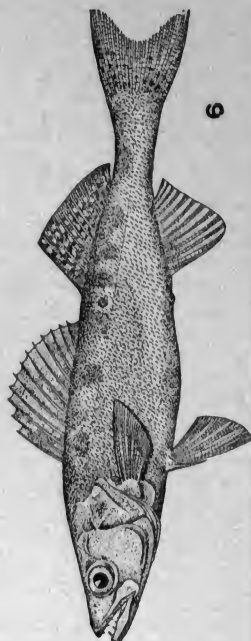
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1. LOG PERCH (*Percina caprodes*).
2. SACRAMENTO PERCH (*Archoplites interruptus*).
3. YELLOW PERCH (*Perca flavescens*).

4. SAUGER (*Stizostedion Canadense*).
5. WARMOUTH (*Channobryttus gulosus*).
6. WALL-EYED PIKE (*Stizostedion vitreum*).

ringed and raccoon perch. Other members of this family are the great tribe (subfamily Etheostominae) of darters, the pike perches, and log perches (q.v.).

Various other unrelated fishes are styled perches. Thus the salt-water perches of California are surf fishes (q.v.); the Sacramento perch (q.v.) is a rock bass; the white perch may be a drumfish in the East or a surf fish in the West; the blue perch and sea perch are cunners (q.v.). See also PIKE PERCH; PIRATE PERCH; TROUT PERCH. Consult: G. B. Goode, *American Fishes* (New York, 1888); Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1898); D. S. Jordan, *Guide to the Study of Fishes* (New York, 1900). See Plate of PERCHES OF NORTH AMERICA.

PERCHERON (për'she-rôn or pèr'chè-rôn) **HORSE**, THE. A valuable breed of draft horse. It is a native of the Department of Perche, in the northwestern part of France. The Percheron originated from stock typical of the heavy-draft type which existed throughout a large part of northern Europe. Crosses were made with the Arab horse, which improved the type in style, bone, and finish as we see it in the modern Percheron. The Percheron of 50 years ago was about 15 or 16 hands high and gray in color, though there were some blacks. To-day the Percheron is somewhat larger, being 15 to 17 hands high and weighing 1500 to 2000 pounds. The head is handsome, the body compact and blocky, and the limbs clean and free from coarse hair. Though gray and black are the prevailing colors, there are some browns and bays. Large numbers of Percherons have been imported to the United States, where it is one of the most popular of heavy-draft breeds.

PERCHLORIC ACID, HClO_4 . A colorless corrosive liquid that may be prepared by distilling potassium chlorate with sulphuric acid and cautiously redistilling the distillate. When brought into contact with organic substances, such as paper or wood, perchloric acid causes almost explosive combustion. It is a monobasic acid that combines readily with bases to form a series of salts called perchlorates. Perchloric acid and the perchlorates are very stable. The acid is the only one of chlorine acids containing oxygen that can be distilled, although partial decomposition does take place. Potassium perchlorate (KClO_4) is formed when potassium chlorate is heated (as in preparing oxygen). Further heating decomposes the perchlorate into potassium chloride and free oxygen. On the other hand, when potassium perchlorate is heated alone, it decomposes with the formation first of the chlorate and chloride of potassium and of free oxygen.

PERCHTA. See BERCHTA.

PERCIER, pār'syâ', CHARLES (1764-1838). A French architect and designer, born in Paris. With Pierre Fontaine (q.v.), his friend and afterward his partner, he was a pupil in the atelier of Peyre; he also studied under Chalgrin and De Gisors. He won the Grand Prix de Rome in 1786. After his return to Paris he designed furniture and scenery for the Opéra, all in the antique style. He did for furniture what David was doing in painting, and, conjointly with Fontaine, may be said to have introduced the classic revival of the Empire. Their first important commission was the remodeling of Malmaison; they were then appointed architects for the Opéra (1794) and of

the Louvre and the Tuileries (1802). They restored the Colonnade built by Claude Perrault (q.v.), and finished the upper story of the buildings on the court in the Louvre; built the chapel, theatre, and other portions of the Tuileries; designed the Arc de Triomphe du Carrousel, the monument to Desaix, the stairway of the Museum of the Louvre (removed by Napoleon III), and restorations and additions at Versailles, Saint-Cloud, and other palaces. Percier also built the tomb of the Countess of Albany at Santa Croce in Florence (1824). His work was marked by great refinement of detail and bears evidence of the influence of Piranesi (q.v.). He had given up his connection with Fontaine in 1814, thereafter working steadily in his atelier, where he conducted a school of architecture. He wrote *Restauration de la colonne Trajane* (1788) and, in collaboration with Fontaine, *Palais, maisons, et autres édifices de Rome moderne* (1802); *Recueil de décorations exécutées dans l'église Notre-Dame et au Champ-de-Mars* (1807); *Choix des plus célèbres maisons de plaisance de Rome et de ses environs* (1809-13); *Recueil des décorations intérieures* (1812).

PERCIN, pèr'sân', ALEXANDRE (1846-). A French general, born at Nancy. In the Franco-Prussian War (1870-71), during which he had been wounded, he rose to be captain. Subsequent promotions were to brigadier general in 1900 and major general in 1903. He was given the directorship of the arms factory at Saint-Etienne in 1893, and in 1908 became a member of the superior council of war. Early in the European War (1914 et seq.) he received an important command, which he lost for a reason never made public by General Joffre.

PERCIVAL, pèr'st-val, JAMES GATES (1795-1856). An American of remarkable versatility—poet, geologist, botanist, surgeon, musician, and linguist. He was born at Berlin, Conn. After graduating from Yale (1815) he followed his various callings at West Point and in Boston, Philadelphia, Charleston, S. C., Connecticut, and Wisconsin. He did good work in geology, and his poetry is generally fluent and occasionally striking. A complete edition of it, with a biographical sketch by Erastus North, was published in two volumes (Boston, 1859). Consult J. H. Ward, *The Life and Letters of James Gates Percival* (Boston, 1866).

PER'CLOSE (OF. *perclose*, *parclose*, inclosure, from ML. *perclusus*, for Lat. *præclusus*, p.p. of *præcludere*, to shut off, from *præ*, before + *cludere*, to close). A railing or other inclosure separating a tomb or chapel from the rest of a church.

PERCOIDEA, or **PERCOIDEI** (Neo-Lat., from Lat. *perca*, perch). A large group of spiny-rayed fishes, including the perches and their near relatives. It embraces the families Centrarchidæ, Percidæ, Cheilopteridæ, Centropomidæ, Serranidæ (sea bass), and others, which are regarded by some ichthyologists as standing at the head of the fish class. The characteristics of this world-wide and important group are given under the names of its various representatives elsewhere described. Consult Jordan and Evermann, *Fishes of North America* (Washington, 1896), and G. A. Boulenger, *Catalogue of the Perciform Fishes in the British Museum* (London, 1897). See PERCH; SEA BASS; ETC.

PER'COLA'TION (Lat. *percolatio*, from *per-*

colare, to strain through, filter, from *per*, through + *colare*, to filter, from *colum*, colander). A process used chiefly in pharmacy for extracting the soluble constituents of suitable substances by the gradual descent through them of a solvent liquid, usually alcohol or alcohol and water, technically known as the *menstruum*.

PERCUS/SION (Lat. *percussio*, from *percute*, to strike through, from *per*, through + *quaterre*, to strike). In medicine, the method of eliciting sounds by tapping or gently striking the surface of the body, its object being to determine by the nature of the sound the comparative density of the subjacent parts. This method of diagnosis is not of recent date, for we find it mentioned by Hippocrates. It was employed by Auenbrugger in the middle of the eighteenth century and later by Corvissart in the investigation of heart disease, and by Laënnec in diseases of the chest. But as the only way of practicing percussion was by striking the surface itself with the tips of the fingers or knuckles, technically known as direct or immediate percussion, its value was limited, and it was not until Piorry introduced the mediate method—the stroke being made not upon the surface itself, but upon some intervening substance applied closely to it—that the practice became useful. This flat intervening body, made of wood, ivory, or gutta-percha, is called a pleximeter. It is struck either with a small hammer, or plessor, or with one or more finger tips. Instead of an ivory or rubber pleximeter the left index or middle finger of the examiner may be used, with its flat surface fitted accurately to the part under investigation. The force of the stroke on the pleximeter, whether the stroke be made with the fingers or the hammer, must vary according as it is desired to elicit the sound from a superficial or a deep seated part. The surface to be percussed should be exposed or, at most, covered with only one layer of clothing; and the blow should fall perpendicularly on the pleximeter. When percussion is made over a considerable cavity filled with air, as the stomach or intestines, a hollow, drumlike, or tympanitic sound is produced. When any part of the surface of the chest is struck below which there is a considerable depth of healthy lung tissue, consisting of small cells filled with air, a clear sound, less loud and hollow than the tympanitic sound, and termed the pulmonary percussion note, depending partly on the vibrations of air in the lung cells and partly on the vibrations of the walls of the chest, is evolved. When the subjacent substance is solid (as the heart, liver, or spleen) or fluid (as when there is effusion into a closed sac), the sound is dull in proportion to the density and want of elasticity of the part struck.

Auscultatory percussion is practiced when, instead of listening to the percussion sounds as transmitted through the air, the stethoscope is placed upon the chest near the point of percussion and the sound conveyed through it to the examiner's ear. See **AUSCULTATION**.

PERCUSSION, CENTRE OF. See **CENTRE OF PERCUSSION**.

PERCUSSION CAP. See **SMALL ARMS**.

PERCY, pĕr'st. The name of a noble family whose head, William de Percy, accompanied William I to England and obtained from him 30 knights' fees in the north of England. The representation of the house devolved in the

time of Henry I (1100-35) on Agnes, daughter of the third baron, who married Josceline of Louvain, who assumed the Percy name. The head of the family at the time was one of the chief barons who extorted Magna Charta from King John; and the ninth feudal lord in the reign of Edward I (1272-1307) maintained, with others of the greater barons, the spiritual independence of the English crown. This nobleman's great-grandson was a distinguished military commander under Edward III, and, acting as marshal of England at the coronation of Richard II, was created Earl of Northumberland. He subsequently, however, took up arms against Richard and placed the crown on the head of Henry of Lancaster, who became Henry IV. Again dissatisfied with the government, he joined in rebellion with his son, Henry Percy, surnamed Hotspur, for the purpose of transferring the crown to Mortimer, Earl of March. (See **PERCY**, **SIR HENRY**.) The Earl, with the other leaders of this rebellion, fell at Bramham Moor (1408), and his titles became forfeited. These, however, were revived in favor of his grandson, who became Lord High Constable of England and who was killed at the battle of St. Albans. This Earl's son and successor (the third Earl) met a like fate on Towton field, fighting in the van of the Lancastrian army. The fourth Earl was murdered by the populace in Northumberland when ordered by Henry VII to enforce a subsidy. The execution of the seventh Earl by Elizabeth is part of the history of England. The eighth Earl was committed to the Tower on a charge of being concerned in a plot in favor of Mary, Queen of Scots, and died a violent death in prison. The tenth Earl fought in the civil wars against Charles I, though he took no part with the regicides, and eventually joined in the general effort to bring about the Restoration. The eleventh Earl left an only child, who succeeded to the ancient barony of Percy and, marrying Charles, Duke of Somerset, became the mother of Algernon, Duke of Somerset, who was created Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, of Stanwick, in the County of York, a gentleman of respectable lineage. Sir Hugh, succeeding to the earldom, obtained in 1766 his advancement to the dukedom of Northumberland. Consult Gerald Brenan, *A History of the House of Percy*, edited by W. A. Lindsay (2 vols., London, 1902).

PERCY, FLORENCE. See **ALLEN**, **ELIZABETH CHASE AKERS**.

PERCY, GEORGE (1580-1632). A British Colonial governor, born at Lyon House, Northumberland. He was a younger son of the eighth Earl of Northumberland and, when still young, served in the army in the Low Countries. He sailed for America with the first Virginia colony in 1606, and is said to have named the settlement James Fort. In 1609 he succeeded John Smith as President of the Council until the arrival of Sir Thomas Gates in 1610. In the latter year he was a member of Lord De la Warr's council, and served as Deputy Governor in charge from March, 1611, until the arrival of Sir Thomas Dale in May. He left Virginia in April, 1612, and in 1625 returned to the wars in the Low Countries, where he commanded a company in 1627. He was a bitter opponent of Capt. John Smith, and attempted to show his unworthiness in *A Trewe Relacyon*

of the proceedings and occurrences of moments which have happened in Virginia from the time Sir Thomas Gates was shipwrecked upon the Bermudas An. 1609 untill my departure out of the Country which was in Anno 1612 (1625).

PERCY, HECTOR, COUNT DE LA FERRIÈRE. See LA FERRIÈRE-PERCY, HECTOR, COUNT DE.

PERCY, SIR HENRY (known as Hotspur) (1364-1403). An English military leader, the eldest son of Henry Percy, first Earl of Northumberland. He was knighted by King Edward III at the same time as the future kings, Richard II and Henry IV. The next year under his father's guidance he began that service on the Scottish border in which he won his greatest fame, and in 1385 became Governor of Berwick. Here his restless warfare against Scottish marauders earned him the nickname of Hotspur. As this was the period of the Hundred Years' War, young Percy was several times sent across the Channel to take part in the continental campaigns, but, though he earned the Garter by his achievements against the French, he always came back to the northern border, where he had been made warden of the marches, and it was there that in 1388 he met a host of Scottish invaders under Douglas, March, and Moray, and fought with them the famous battle of Otterburn, which has been immortalized by the ballad of Chevy Chase. Victory was claimed by both armies, but probably what advantage there was lay with the Scotch, who, though they lost in Douglas the most renowned of their leaders, succeeded in capturing Percy. The latter, by some means not clearly ascertained, became free in 1389. In 1399 he joined Henry of Lancaster in his successful rebellion against Richard II—indeed, the Percys claimed that they made the rebellion successful—and after the coronation of the new King as Henry IV he was rewarded by the gift of offices and lands which made the already powerful nobleman almost a rival to the King. It was not long before Henry began to feel that the Percys were too powerful for the well-being of his Kingdom, and when, as a contrast to an unsuccessful campaign of his own against the Welsh, Hotspur won a brilliant victory over the Scotch at Homildon Hill, the King began to withdraw his favor from his formidable vassal. The Percys quickly resented this and, forming an alliance with Owen Glendower, the Welsh leader, the Douglasses, and other Scottish families, raised the standard of revolt in favor of the young Earl of March, whom they proclaimed King of England. Henry met the insurgents near Shrewsbury, and a desperate battle was fought in which Hotspur was killed and his forces defeated. Consult: Froissart, *Chronicles*; Wallon, *Richard II*; Ramsay, *Lancaster and York*; Wylie, *History of Henry IV*; Percy, *Reliques of Ancient English Poetry*.

PERCY, JOHN (1817-89). An English metallurgist, born at Nottingham. He studied medicine at Paris and Edinburgh, but afterward devoted himself to metallurgy, and in 1851 was appointed lecturer, and later professor, in the Metropolitan School of Science, now the Royal College of Science. During his connection with this institution he did much to place English metallurgy on a scientific basis. He discovered a process of extracting silver from its ores, which largely suggested the improved processes later employed in Europe and the United States; and his work also suggested improved processes of making Bessemer steel from iron ores con-

taining phosphorus. In 1876 he received the Bessemer medal of the Iron and Steel Institute (London), of which he was president in 1885-86. He published: *Iron and Steel* (1864; 2d ed., 1875); *Lead* (1870); *Silver and Gold* (1880).

PERCY, THOMAS (1560-1605). An English conspirator. He obtained promises from James VI of Scotland in 1602, which he interpreted as an assurance of toleration for Roman Catholics upon James's accession to the English throne. Being disappointed in his expectations, he joined Catesby, John Wright, Thomas Winter, and Guy Fawkes in the Gunpowder Plot (q.v.). Upon the discovery of the plot Percy fled with the others, but was overtaken and mortally wounded at Holbeche.

PERCY, THOMAS (1729-1811). An English antiquary, editor of the *Reliques of Ancient English Poetry*, born in Bridgnorth, Shropshire, April 13, 1729. He graduated from Christ Church, Oxford, B.A. in 1750 and M.A. in 1753, and proceeded D.D. from Emmanuel College, Cambridge, in 1770. In 1753 he was given the vicarage of Easton-Maudit, Northamptonshire, where he remained 29 years. In 1782 he was appointed Bishop of Dromore in Ireland, where he resided till his death, Sept. 30, 1811. Percy published two most important works. While visiting his friend Humphrey Pitt at Shifnall in Shropshire, he found a folio manuscript (early seventeenth century) "lying dirty on the floor under a bureau in the parlour." This manuscript he made the basis of *Reliques of Ancient English Poetry* (1765), a collection of English ballads, which has been aptly called the Bible of the Romantic movement. It marks the first decisive return in England to the ballad measure, afterward to be so beautifully employed by Coleridge. The publication exerted, too, great influence in Germany. To the awakened interest in Norse mythology Percy contributed *Northern Antiquities* (1770), which was a translation of the introduction to *L'Histoire de Dannemarc* (1755) of Paul Henri Mallet. He also edited *The Household Book of the Earl of Northumberland in 1512* (1768) and thus set the example for many similar publications. As a poet he was best known for *The Hermit of Warkworth* and the ballad "O Nanny, wilt thou gang with me?" Of interest, too, as showing Percy's curiosity, is a translation of a Chinese novel from a Portuguese manuscript (1761). Percy's portrait was painted by Sir Joshua Reynolds, and he was honored by a group of scholars who gave his name to the Percy Society (1840-52), founded for the publication of old ballads. Consult the *Reliques*, edited by H. B. Wheatley (London, 1876-77 and 1891, and New York, 1910; also in Everyman's Library, ib., 1906), and the *Folio Manuscript*, edited by Hales and Furnivall (London, 1867-68); also A. C. C. Gausson, *Percy: Prelate and Poet* (ib., 1908). See ROMANTICISM.

PERCY ANECDOTES. A collection of popular anecdotes which appeared in 44 monthly parts (20 vols., 1821-23). They professed to have been written by "Sholto and Reuben Percy, brothers of the Benedictine monastery of Mount Benger." "Reuben" was really Thomas Byerley (died 1826), editor of the *Mirror of Literature*, while "Sholto" was Joseph Clinton Robertson (died 1852), editor of the *Mechanics' Magazine*. The name of the collection was taken from the Percy coffeehouse in Rathbone Place, London, where Byerley and Robertson were accustomed

to meet. Though Lord Byron declared that no one could pretend to move in polite society without a familiarity with the *Anecdotes*, they are, for all that, of little value or authority. Consult the *Percy Anecdotes*, edited by Timbs (new ed., 4 vols., London, 1887).

PERDICCAS (Lat., from Gk. Περδικκας, *Perdikkas*). The name of several Macedonian kings.—**PERDICCAS I**, the founder of the Macedonian dynasty, an Argive of the Heraclid or Temenid race, who emigrated to Macedonia about 700 B.C.—**PERDICCAS II**, son and successor of Alexander I, reigned probably from 454 to 413. He was friendly to the Athenians in the early part of his reign, but more or less at enmity with them later on and in the course of the Peloponnesian War.—**PERDICCAS III**, brother of Philip of Macedon, was the successor of Alexander, son of Amyntas, and reigned from 365 to 360 B.C.

PERDICCAS. A general of Alexander the Great, a prince of the Macedonian royal line, son of Orontes. He took part in nearly all the important battles fought by Alexander and in the distribution of honors at Susa received for his services a crown of gold and the daughter of the Median satrap for his wife. Alexander on his deathbed gave to Perdicas his signet ring, which was the symbol of royal power. Arrhidæus, the natural son of Philip, being recognized as king, Perdicas was appointed to the chief military command under the new sovereign. He soon, however, established his influence over Arrhidæus and obtained virtual control of the government. A league was at length formed against him by Antipater, Antigonus, Craterus, and Ptolemy. He marched into Egypt to oppose Ptolemy, but was assassinated in 321 B.C., near Memphis, by his own soldiers.

PERDIDO (*Sp. pron. pēr-dē'dō*) **RIVER**. A small river flowing through Perdido Bay into the Gulf of Mexico on the boundary between Florida and Alabama (Map: Alabama, B 5). In 1803, when the United States came into the possession of Louisiana, the Perdido was claimed by the United States as the eastern boundary. Spain protested and was supported by France. The question was finally settled in 1819 by the Treaty of Washington, when west Florida was ceded to the United States.

PERDITA, pēr'di-tā. The daughter of Leontes, King of Sicily, in Shakespeare's *Winter's Tale*, brought up by a shepherd and married to Prince Florizel.

PERDITA. See ROBINSON, MARY (DARBY).

PEREA. See PEREA.

PEREDA, pā-rā'bā, JOSÉ MARÍA DE (1833–1906). A Spanish novelist, born Feb. 6, 1833, at Polanco in the Province of Santander. He was trained to become a military engineer and artilleryman, but, being a man of means, he devoted himself to literature, after the publication of his first volume of sketches of manners, the *Escenas montañosas* (1864). In his chief works Pereda gives pictures of mountaineer and seaside life that are remarkable for detail and charm of description. The *Escenas montañosas* (consult the second series of them, entitled *Tipos y paisajes*, 1871) were long left unnoticed, yet some of the sketches in the volume, and especially that entitled *La leva*, are among his best works. A volume of sketches, *Bocetos al temple* (1876), was followed by the collection *Tipos trashumantes* (1877), exhibiting various common types of the Province of Santander. *El*

buely suelto (1877), an account of the life of an egotistical rake, is interesting as first showing in a marked way the author's inclination to adopt some of the methods of naturalism in the novel. In *Don Gonzalo González de la Gonzalera* (1878) the author sets forth the grotesque character of an electioneering campaign in Spain. In the *Pedro Sánchez* (1883) he portrays the Spanish capital as it was in 1854 and conducts his hero through a career of political intrigue and ugly married life. The *Sotileza* (1884), often deemed Pereda's masterpiece, is a description of life at the seaside and among the fishing folk. His later works include: *La Montañez* (1888); *La puchera* (1889); *Nubes de estío* (1891); *Al primer vuelo* (1891); *Piñas Arriba* (1895); *Pachín González* (2d ed., 1896). A rule of the Spanish Academy was suspended in 1896 so that Pereda, not a resident of Madrid, might become a member. He died in the place of his birth, March 1, 1906. Consult the *Prólogo* of Menéndez y Pelayo, prefacing the first volume of the *Obras completas* of Pereda (Madrid, 1887 et seq.), and the edition of *Pedro Sánchez*, with detailed study of the author and his works by R. E. Bassett (New York, 1907).

PÈRE DUCHESNE, pār dy'shân'. See HÉBERT, JACQUES RENÉ.

PÈRE ENFANTIN. See ENFANTIN, BARTHÉLEMY.

PÈRE GORIOT, pār gō'rē'ō', LE. A novel by Balzac (1835). The title character is an old man devoted, to the point of mania, to his unworthy daughters, who forsake him on his deathbed.

PEREGRINE (pēr'tē-grīn) **FALCON** (OF. *peregrin*, *pelcgrin*, Fr. *peregrine*, from Lat. *peregrinus*, foreign, stranger, from *perager*, being in foreign places, from *per*, through + *ager*, field; ultimately connected with Eng. *acre*). A species of falcon (*Falco peregrinus*) found in almost all parts of the Northern Hemisphere and in Africa and South America. The female is about 18 inches long, the male only about 15 inches. The female is the "falcon" of falconers and the male the "tercel." The peregrine falcon of America is popularly known as the "duck hawk" and is regarded by ornithologists as a subspecies (*anatum*) of the European bird; the form from the northwest coast of America is also regarded as another subspecies (*pealei*). The back, wings, and tail are bluish gray, the feathers barred with a darker tint; the crown, neck, and a spot below the eye nearly black; the throat white with dark longitudinal lines, the breast, belly, and legs whitish with dark bars. The wings reach almost to the tip of the tail, and the bird is remarkable for its power of flight. The peregrine falcon can carry in flying a bird or quadruped fully its own weight. Its ordinary prey consists of ducks, grouse, woodcocks, and rabbits. Owing to the quantity of preserved game the peregrine falcon captures, it is ruthlessly destroyed in Great Britain and is in danger of extermination. It makes its nest on ledges of high rocks and lays from two to four eggs. It nested on the Palisades of the Hudson as late as 1899. Numerous localities in Great Britain have long been noted as breeding places of the peregrine falcon, and some of them are regularly visited for the young birds, which are still trained in certain places for the sport of falconry. For the American

bird, consult A. K. Fisher, *Hawks and Owls of the United States* (Washington, 1893), and Francis Heatherley, *Peregrine Falcon at the Eyrie* (New York, 1913). See Plates of EAGLES AND HAWKS, FALCONS AND FALCONRY.

PEREGRINE PICKLE, THE ADVENTURES OF. A novel by Tobias Smollett (1751).

PEREGRINUS PROTEUS. A Greek Cynic philosopher, of the second century, born at Parium in Mysia. Driven from his native city because he was suspected of parricide, he went ultimately to Palestine and became prominent there among the Christians. Later he was accused of profaning Christian rites and was excommunicated. Presently, in Egypt, under the influence of Agathoboulos, a well-known Cynic, he became himself a Cynic, teaching especially at Athens. After a time various things, especially his attacks on Herodes Atticus, caused his popularity to wane. Hence he gave notice widely that at the Olympian Games of 165 he would destroy himself on a funeral pyre, and this intention he carried out. Consult Lucian (q.v.), *Περὶ τῆς Περεγράνου Τελευτῆς*, *Peri tēs Peregrinou Teleutēs* (The Life's End of Peregrinus), to be found conveniently in F. G. Allinson, *Lucian: Selected Writings*, pp. 200-236 (Boston, 1905). Professor Allinson, in introduction (200-208) and notes, discusses well Peregrinus' life and gives the ancient and modern authorities concerning him. See also Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. II (5th ed., Munich, 1913).

PÈRE HYACINTHE, pâr ê'â'sânt'. See LOYSON, CHARLES.

PEREIRA, pe-râ'rá, JONATHAN (1804-53). An English pharmacologist, born in Shoreditch, London. He studied medicine and was licensed by the apothecaries in 1823, became apothecary and chemical lecturer at the Aldersgate Dispensary in the same year, fellow of the Royal College of Surgeons in 1825, professor of materia medica at the Aldersgate Street Dispensary in 1832, professor of chemistry in London Hospital in 1833, took the degree of doctor of medicine in 1840 at Erlangen, was licensed to practice in London in 1841, and became physician to the London Hospital in 1851. Pereira's attention turned early in the direction of the science of pharmacology, in which he became famous. He published many papers on the properties and adulteration of drugs and many monographs and several textbooks on chemistry. His most important work was the *Elements of Materia Medica and Therapeutics* (1839-40), remarkable for the extent of its research, variety of information, and exactness. He also published a *Treatise on Food and Diet* (1843, 4th ed., 1854), *Lectures on Polarized Light* (1843; 2d ed., 1854), and *The Physician's Prescription Book* (1824, 18th ed., 1890). His other works include a translation of the *London Pharmacopœia* (1824) and *Manual for the Use of Students* (1826).

PEREIRA DA SILVA, pá-râ'rá dâ sêl'vâ, JOÃO MANOEL (1819-98). A Brazilian historian, biographer, and literary critic, born near Rio de Janeiro. He studied law in Paris, traveled in Europe, and returned to Brazil in 1841 an ardent Liberal, but after entering politics became a Conservative. In 1857 he was President of the Province of Rio de Janeiro. His great services were rewarded by various orders. He wrote the valuable historical works *História de fundação do Imperio Brasileiro* (7

vols., 1864-68), *Segundo periodo do reinado de Dom Pedro I do Brazil* (1871), and *História do Brazil durante a menoridade de Dom Pedro II 1831-40* (1882); the biographical sketches *Plutarcho brasileiro* (1866); and in literary criticism, *La littérature portugaise, son passé, son état actuel* (Paris, 1865), and *A poesia epica* (1889).

PEREIRE, pá'râr', EMILE (1800-75) and ISAAC (1806-80). French bankers, distinguished for having instituted schools for the deaf and dumb in France. They were born at Bordeaux. They early carried on at Paris a small brokerage business. By the construction of the railway from Paris to Saint-Germain (1835), the first in France, they established their reputation. In 1852 they founded the Société du Crédit Mobilier (see CRÉDIT MOBILIER), at the collapse of which they lost most of their fortune. They were grandsons of Giacobbo Pereire. Isaac, who was also a deputy from 1863 to 1869, published *La Banque de France et l'organisation du crédit en France* (1864), *Budget de 1877* (1877), and *Politique financière* (1879).

PEREIRE, pá-râ'rá, GIACOBBO RODRÍGUEZ (1715-80). One of the inventors of the deaf-mute language. He was born in Berlanga, Estremadura, of a Spanish-Jewish family, Pereira, but early moved to France. He is credited with being the first person to teach a deaf-mute to speak. He made a demonstration thereof, and of his newly devised sign alphabet, before the French Academy of Sciences in 1749, to the entire satisfaction of the members. In 1759 he was made a member of the Royal Society of London. Consult Edward Seguin, *Notice sur J. R. Pereire* (Paris, 1847).

PÈRE-LACHAISE, pâr-lâ'shâz'. A cemetery of Paris. See LACHAISE.

PERELMAN, pá'rel-man, OSIP ISIDOROVITCH. See ДИМОВ, OSIP (pseudonym).

PERENNIALS (from Lat. *perennis*, lasting throughout the year, from *per*, through + *annus*, year). Plants whose duration is more than two years, contrasted with annuals and biennials. In many herbs the aerial parts are annual, while certain subterranean parts are perennial. As ordinarily used, however, the term is applied to plants whose aerial parts are also perennial, as shrubs and trees. See DURATION.

PERESKIA, pê-rês'ki-â. A West Indian plant belonging to the cactus family. See BARRADOS GOOSEBERRY.

PEREYASLAV, pá-râ-yâs'lâf. A district town in the Government of Poltava, Russia, 176 miles west-northwest of Poltava, near the Dnieper. There are ruins of ancient fortifications. The church of the Assumption was founded as early as 1010, although the present structure dates from the seventeenth century. The town itself dates from 993 and played a very conspicuous part in the history of Little Russia. Its grain trade is important. Pop., 1897, 14,609; 1911, 18,635.

PÉREZ, pâ'râth, ANTONIO (1539-1611). A Spanish statesman, minister of Philip II, born at Monreal de Ariza, Aragon. He was a natural son of Gonzalo Pérez, one of the ministers of Charles V and of Philip, and entered upon administrative duties in 1567, after studying at Louvain, Venice, and Madrid. He was the trusted agent of Philip. In 1578 Juan de Escobedo arrived at Madrid to solicit aid for John

of Austria, then engaged in the struggle against the Netherlands. Escobedo incurred the hatred of the King and of Pérez, and with the consent of Philip Pérez brought about his assassination (March, 1578). The family of Escobedo denounced Pérez as the murderer, and all his enemies joined against him. The King at first sought to shield him, but on learning of the relations between Pérez and the Princess of Eboli, mistress of Philip, he became the secret instigator of Pérez's enemies. In 1589 Pérez succeeded in escaping to Aragon and demanded protection in the courts of that privileged kingdom. The *justicia mayor*, or highest court of justice in Saragossa, refused to deliver him up. The King applied to the Inquisition for aid in 1591, and the Aragonese court surrendered him to its agents, but the people rose and liberated him. At last, in September, 1591, Philip II entered Aragon with a powerful army, abolished the old constitutional privileges of the country, and executed a number of the leaders. Pérez, however, escaped, avoiding the plots which the King laid for his assassination. He was condemned in Spain as a heretic, but was well received in Paris and London. He spent the later years of his life in Paris, and died there Nov. 3, 1611, in great poverty. Pérez wrote an account of his experiences, which was published under the title of *Relaciones* (London, 1594), and other works. Consult: F. A. M. Mignet, *Antoine Pérez et Philippe II* (Paris, 1845); Muro, *Vida de la princesa de Eboli* (Madrid, 1877); J. A. Froude, *Spanish Story of the Armada* (New York, 1892); M. A. S. Hume, "Antonio Perez in Exile," in *Royal Historical Society, Transactions*, vol. viii (N. S., London, 1894); id., *Espanoles & Ingleses* (Madrid, 1903), based on newly discovered manuscripts.

PEREZ, pā'rēts, ISAAC LOEBUSH (1851-1915). A Yiddish and Hebrew writer, born at Zamose, Russian Poland. Supplementing the traditional orthodox Jewish education with secular studies, he took up law, which he practiced until compelled by governmental restrictions to discontinue. He then moved to Warsaw and became secretary of the Jewish Community, a position which he held till his death. All his early work was done in Hebrew, but, seeking a wider audience, Perez soon adopted the more popular Yiddish, which he never afterward abandoned. In Hebrew his works include *Stories in Verse and Miscellaneous Poems* (1877), *Ha-Ugab* (*Love Poems*, 1894), and *Ketabim* (*Collected Writings*, 4 parts, 1899-1901). The first collection of his Yiddish works appeared, under the title *Schriften*, in 1906; a complete edition comprises 10 volumes and includes *Folk Tales* (1909), *Dramas* (1910), *Adam and Eve* (1910), *Chasidisch* (1911), *Sketches and Pictures* (1911), *For Young and Old* (1911), and *The Old and the New* (1912). Perez's works have been translated into several languages, notably into German: in English may be had *Stories and Pictures* (1906). Perez was a great literary artist, at once realist and symbolist, humorist and satirist, poet and essayist, novelist and dramatist. In his fiction, especially in his Chasidic tales, he tells the story of the common people so vividly that one need but read his works to understand the Jew of his day. His dramas, which are not actable, constitute the single exception to the general excellence of his work. As one of the most cultured and intellectual of Jewish writers, Perez did much

to spread progressive ideas and to encourage art and literature among the Jews. Consult Pinès, *Histoire de la littérature judéo-allemande* (Paris, 1910).

PÉREZ DE HITA, pā'rāth dā 'tā, GINÉS. A Spanish soldier and author, of the second half of the sixteenth century. Neither the date nor the place of his birth or death is known, but probably he was a native of Murcia. He served under Philip II during the Alpujarra insurrection, but is better remembered as the author of *Historia de las guerras civiles de Granada* (1595 and 1604), which covers the period from the battle of Alporchones to the death of Alfonso of Aguilar (1501). There is an edition in Rivadeneyra's "Biblioteca de autores españoles," vol. iii (Madrid, 1876). Pérez de Hita's history has served as the basis of many subsequent works, notably Irving's *A Chronicle of the Conquest of Granada*. Its popularity in France is said to have caused the literary movement that began with Mademoiselle de Scudéry's *Almahide* and Madame de Lafayette's *Zaïde*. Consult Marcelino Menéndez y Pelayo, "Orígenes de la novela," in *Nueva biblioteca de autores españoles*, vol. i (Madrid, 1905), and a reproduction of the first edition of the first part (with an uncritical introduction) by Paula Blanchard-Demouge, (*Guerras civiles de Granada, primera parte* (ib., 1913).

PÉREZ DE MONTALVÁN, JUAN. See MONTALVÁN, JUAN PÉREZ DE.

PÉREZ GALDÓS, gāl-dōs', BENITO (1845-). A Spanish novelist, born in the Canaries. In 1863 he went to Madrid to study law, but soon turned to journalism and creative writing. In 1889 he was elected to the Royal Spanish Academy and later to the national Cortes. One of the most prolific of modern Spanish men of letters, Galdós shows evidence of strong revolutionary sympathies. A very important part of his literary work was the composition of the collection of tales known as the *Episodios nacionales*. Of these historical romances, the first two series, embracing 20 stories, were completed in 1883. Writing them under the inspiration of the *romans nationaux* of Erckmann-Chatrian, Galdós gives with historic fidelity and in great detail an account of the struggle for Spanish independence of the Napoleonic invader. The last novels of the second series bring his treatment of political events down to some 15 years after the return to Ferdinand VII. In a third series he continues his epic down to even more recent times, dealing with the Carlist War of 1833-40, the last volume, *Bodas reales*, treating of the marriages of Isabella II and her sister. The fourth series brings the story down to the revolution of 1868 and the exile of Isabella from Spain. A fifth series of 10 volumes, in course of publication in 1915, will carry the account to the close of the century. Galdós ranks well in the domain of the novel, romantic, realistic, and psychological, having written several works generally grouped together as *Novelas de la primera época* and *Novelas españolas contemporáneas*. Of the former group are: *Doña Perfecta* (1876), perhaps his most widely known novel; *Gloria* (1877); *La familia de León Roch* (1878); and *Marianela* (1878). Of the latter are such stories as *El amigo Manso* (1882); *El doctor Centeno*; *Fortunata y Jacinta* (1887); *Miau* (1888); *Angel Guerra* (1891); and especially *Nazarín*

and *Misericordia*, which by many are considered his best works. The vogue of these novels has been even greater than that of his *Episodios nacionales*. In general they exhibit the contrast between old and blindly conservative elements of Spanish life on the one hand and the new revolutionary ideas of the modern world on the other. The plays of Galdós are inferior to his novels. Chief among them are: *Realidad* (1892); *La loca de la casa* (1893); *La de San Quintín* (1894); *Los condenados*; *Voluntad*; *Doña Perfecta* (1900); *La fiera*; *Elcetra* (1901), which created a furore and was of lasting influence; *El Abuelo* (1904); *Bárbara* (1905). Consult: Alas, B. Pérez Galdós: *estudio crítico-biográfico* (2d ed., Madrid, 1889); Pardo Bazán, *Polémicas y estudios literarios* (ib., 1892); and Luis Antón del Olmet and Arturo García Carraffa, *Galdós* (Madrid, 1912).

PERFALL, pər'fal, ANTON, BARON (1853-1912). A German novelist, born in Landsberg. He was educated at Munich, there married an actress, Magda Irschik, with whom he made an American tour in 1879, and later settled at Sehlersee in Bavaria. Among his novels treating social-political themes, and several collections of stories, may be mentioned: *Ueber alle Gewalten* (1889); *Damon Ruhn* (1889); *Truggeister* (1892); *Die Sünde* (3d ed., 1896); *König Erfolg* (1899); *Verkauftes Genie* (1900); *Die Uhr* (1901); *An der Tafel des Lebens* (1902); *Munchener Kindeln* (1904); *Allerhand Lebendiges* (2d ed., 1905); *Aus meinem Jugerleben* (1906).

PERFECTION, CHRISTIAN. See HIGHER LIFE.

PERFECTIONISTS. The name adopted by John Humphrey Noyes (q.v.) and his early followers. Their first settlement was at Putney, Vt., whither he retired soon after beginning to preach his peculiar views in 1834, and where he gradually gathered about him a small school of believers. His views were expressed in a paper, the *Perfectionist*, published at Putney, 1843-46. In accordance with the teaching of Noyes they held that Christ had actually returned to earth before the close of the Apostolic age, that his work of saving from sin was complete, and consequently all who were willing to accept his divine reign lived "no longer under law, but under grace" and could do no wrong. The aim being to live together as one family, all possessions were held in common, and a system of complete communism was gradually worked out, involving the institution of "complex marriage." The community was broken up in 1847 by the opposition of their neighbors. The members who held together founded the Oneida Community (q.v.). Consult W. A. Hinds, *American Communities and Co-operative Colonies* (2d rev. ed., Chicago, 1908).

PERFECT NUMBER. A number equal to the sum of its aliquot parts, with unity added; e.g., 6 is such a number since $6 = 1 + 2 + 3$. If the sum of the aliquot parts is greater or less than the number itself, then the latter is called respectively a *redundant* or *defective* number ($8 > 1 + 2 + 4$; $12 < 1 + 2 + 3 + 4 + 6$). This classification is due to the Pythagoreans.

PERFUMERY (from *perfume*, OF. *per-fumer*, Fr. *parfumer*, to perfume, from Lat. *per*, through + *fumare*, to smoke, from *fumus*, smoke; connected with Skt. *dhūma*, smoke). A substance which is prepared for use on account of its agreeable odor. Perfumes have been used

from the earliest times. Among the nations of antiquity an offering of delicate odors was regarded as a token of respect and homage. The burning of incense formed a part of the Hebrew as of pagan rituals, and hence its use is frequently referred to in the Old Testament. This practice still continues, particularly in the ceremonials of the Roman Catholic church. The use of perfumes was common among the Greeks and Romans, and both Pliny and Seneca possessed considerable knowledge respecting perfume drugs. Among the Athenians perfumes were used at feasts, at funerals, and in theatres, the odor of the violet being generally preferred. Both nations learned the use of the still from the Egyptians and applied it to the manufacture of perfumes. The Arabs were skilled in the preparation of fragrant waters, and it was from them, through the Crusaders, that the art was reintroduced into mediæval Europe. The discovery of the process of distillation, which seems to have been forgotten, gave in the fifteenth century fresh impetus to this industry, and at its close distilled oils of benzoin, cedar, cinnamon, rose, and rosemary were articles of commerce.

Perfumes may be divided into two general classes, viz., natural perfumes and the artificial or synthetic perfumes. Natural perfumes are of animal or of vegetable origin; artificial perfumes are chemical compounds which resemble natural perfumes in their odor. Artificial perfumes are also of two general classes. In one the compounds which produce the perfume in nature have been discovered and then reproduced synthetically, this is the case with vanillin. In the other only the odor of the natural perfume is imitated in a substance which is itself unlike the substance whose odor it possesses; this is true of artificial musk.

The four principal animal perfumes are musk, civet, ambergris, and castor. *Musk* is the dried secretion of the preputial follicles of the musk deer. A similar substance is secreted by the musk ox, muskrat, and the Florida alligator. *Civet* is secreted by the *Viverra civetta* and *Viverra zibetha*. It is found in a double pouch under the tail, from which it is taken from the living, caged animal, two or three times a week. *Ambregris*, a biliary secretion of the spermæcti whale, is supposed to be produced by a diseased condition of the organs. It is found floating on the sea. *Castor* is a glandular secretion of the beaver. When fresh it is in a semiliquid condition and is prepared for commerce by drying in smoke. The animal perfumes are valuable for the permanence which their presence imparts to the more evanescent vegetable odors.

The list of vegetable perfumes, if complete, would be very long. The odor of plants may be found in the leaves, as in sage, thyme, and mint; in the bark, as in cinnamon and cassia; in the wood, as in cedar and sandalwood; in the flower petals, as in the rose and violet; in the seeds, as in anise and caraway; in the roots, as in the orris; in the fruit rind, as in the orange; or it may be secreted in the form of resinous gum from the tree itself, as the camphor and myrrh. Perfumes of the last-named class have been used from time immemorial.

A series of patient experiments conducted during the latter half of the nineteenth century by Grimaux, Lauth, and other chemists, resulted in the discovery that natural odors could be reproduced in the laboratory by combining the

substances which produce such odors in nature. The synthesis of vanillin, the active odorous ingredient of the vanilla pod, by Tiemann and Haarmann, marked the beginning of the manufacture of artificial perfumes on a commercial basis. Tiemann discovered that coniferin, the glucoside found in the sap of the pine, could be split up, by means of hydrolyzing agents, into glucose and coniferyl alcohol, of which vanillin is the aldehyde. Later it was found that the same substance could be produced more cheaply by the oxidation of eugenol, the chief constituent of the oil of cloves, and it is from this source that artificial vanillin is manufactured. The industry has acquired considerable importance both in Europe and America. Another important perfume is ionone, or the artificial odor of violets. It is obtained by condensing citral with ordinary acetone in the presence of an alkali, the resulting product being then treated with dilute acids. Mirbane oil, the artificial oil of bitter almonds, is derived from benzene. The benzene is treated in a still with two parts of fuming nitric acid and one part of concentrated sulphuric acid. These acids are added slowly, and at the end of the chemical reaction the liquor, on adding water, separates into two layers, one of which, on further purification, produces the mirbane oil. Many other synthetic perfumes have been discovered, some of which are produced as the by-products of other industries, or from what were formerly regarded as purely waste materials. The manufacture of artificial musk was introduced by Baur in 1888. A mixture of isobutyl chloride and toluene is heated with aluminium chloride ("Friedel and Crafts' reaction"). Water is added to the product of this reaction, the compound is distilled, and the distillates are collected and treated with nitric and sulphuric acids, and the product is washed with water. When treated with alcohol, crystals having a marked odor of musk are produced. At the present time perfumers use the synthetic products extensively, blending them successfully with the natural products. The terms quadruple, triple, double, and simple refer to strength, 12 parts of triple extract will furnish 20 parts of double or 30 of simple by dilution with water and alcohol.

The processes employed in obtaining natural vegetable perfumes are described under OILS, *Volatile or Essential Oils*.

The centre of the natural perfumery industry has for many years been in Grasse, France, in whose factories, it is said, the product of 5,500,000 pounds of orange blossoms, 4,400,000 pounds of roses, 1,400,000 pounds of jasmine, 800,000 pounds of violets, and 80,000 pounds each of cassia and tuberose is used annually. The culture of flowers for perfumery is carried on also in Turkey, Bulgaria, Arabia, India, and Syria. In the United States, according to the census of 1910, there are 429 establishments engaged in the manufacture of perfumery and cosmetics; the total number of employees, 2375, and the total value of the product, \$14,212,000. According to the United States Statistical Abstract for 1914 the value of perfumeries and other toilet preparations imported was \$2,309,000, while for 1890 it was \$444,964.

Bibliography. R. S. Cristiani, *Perfumery and Kindred Arts* (Philadelphia, 1877). Carl Deite, *Practical Treatise on the Manufacture of Perfumery* (Eng. trans. 1b, 1892). G. F. Jaubert, *Matières odorantes* (Paris, 1900), Georg

Colm, *Die Riechstoffe* (Brunswick, 1904), E. J. Parry, *Chemistry of Essential Oils and Artificial Perfumes* (2d ed., New York, 1909), E. T. Charabot, *Industrie des parfumes naturels. les principes odorantes des végétaux, méthodes de dosage, d'extraction, d'identification* (Paris, 1912), G. W. Askinson, *Perfumes and Cosmetics* (4th ed., New York, 1915).

PERGA, APOLLONIUS OF. See APOLLONIUS OF PERGA.

PERGAMON, **PERGAMUM**, or **PERGAMUS** (Lat. from Gk. Πέργαμον, Pergamon, Πέργαμος, Pergamos, Pergamos). An ancient city of Mysia, in Asia Minor, capital of the kingdom of the same name (Map Greece, Ancient, E 2). The city lay in the valley of the Caicus, about 15 miles from the coast. The Acropolis is a lofty hill, about 1000 feet in height, situated between the streams Selnus and Cetus, of which the former flowed through the later lower city, now partly covered by the modern town of Bergama. The early history of the place is lost in legend, which declared that the Greek inhabitants came from Arcadia under Telephus, son of Heracles by Auge, and that the name was derived from Pergamos, grandson of Achilles. In the fourth century B.C. it was the seat of a Greek population, but it was not till the early third century that it rose to prominence. Its impregnable Acropolis was chosen by Lysimachus as a hiding place for his treasure of 9000 talents (about \$10,000,000), which he intrusted to a certain Philetarus. In 283 B.C. a revolt of Asiatic cities against Lysimachus enabled Philetarus to become master of the place, and the defeat and death of Lysimachus, two years later, enabled him to consolidate his power, at first in dependence upon the Seleucidae of Syria, but later as independent ruler of the neighboring regions of Mysia and the Troad. In 263 B.C. he was succeeded by his nephew Eumenes I (263-241), who maintained his power against the attacks of Antiochus I of Syria and developed the resources and prosperity of his little kingdom, which he ruled under the title of dynast. His cousin and successor, Attalus I (241-197), really placed the new principality on a firm basis through his victories over the Gauls and Antiochus II, whereby he became master of a great part of northwestern Asia Minor, and, though later he was compelled to relinquish part of his conquests, his wise policy of allying himself with the distant power of Rome, against his neighbors of Syria and Macedon, enabled him to leave a well-established kingdom to his son Eumenes II. In addition to his military and political ability Attalus, who assumed the royal title after his defeat of the Gauls, did much to make his capital the centre of the artistic and literary life of Asia. He erected near the city a splendid temple and grove in honor of Athena Nikephoros (bringer of victory) and also splendid artistic monuments of his triumphs. To these groups belonged the bronze originals of the well-known Dying Gaul of the Capitol and the Gaul and his Wife of the Ludovisi collection in Rome. At Athens he erected the stoa of Attalus and placed on the Acropolis a series of small bronze figures representing the battles of the Athenians with the Amazons and the Persians, the Gods with the Giants, and the Pergamenes with the Gauls, possibly reduced copies of his monuments in Pergamum and now known to us in part through a series of small marble figures in Naples, Rome,

Venice, and Paris. Eumenes II (197-159) continued the Roman policy of his father and was rewarded after the defeat of Antiochus the Great with the greater part of Asia Minor, except Lycia and Caria. To his reign belong the great altar of Zeus and the development of the great library, which seems to have been founded by Attalus I. (For the former see PERGAMON, GREAT ALTAR OF.) The library was established by the King in the halls which surrounded the temple of Athena Polias above the Agora and was enriched with a collection of books rivaling the foundation of Ptolemy at Alexandria. (See LIBRARIES.) Here, too, was gathered a band of scholars about Crates of Mallos, who developed a school of grammatical study, which in opposition to the Alexandrians emphasized the anomalies rather than the analogies of language. (See ANOMALISTS AND ANALOGISTS.) To Pergamon was attributed the invention of a fine parchment (q.v.) for use in books when the jealousy of the Egyptians endeavored to check the activity of the Pergamenes by prohibiting the export of papyrus paper. Under the brother of Eumenes II, Attalus II (159-138 B.C.), the traditional policy of friendship with Rome was continued and the prosperity and power of the little kingdom increased by successful wars with Bithynia and Thrace. His nephew, Attalus II (138-133), was a student and writer, especially on agriculture, zoölogy, and botany. He left no heirs and by his will bequeathed his kingdom freed from under Roman protection. An attempt of a pretender, Aristoniceus, to seize the power led to Roman intervention, and in 129 B.C. the Province of Asia was organized with Pergamon as its capital. The city long remained in this position, the seat of a provincial council and an important centre of Asiatic trade. On the summit of the Acropolis was the temple of Augustus and Rome, and later a temple to Trajan was added. It seems to have declined under Byzantine rule, though its strategical importance led to the fortification of the hill with a strong wall. Under Turkish rule this fortress was abandoned, but the unfortified town in the plain continued to exist and is now a thriving place of some 20,000 inhabitants, bearing the name of Bergama. The recovery of Pergamon is due to Carl Humann, a German civil engineer, whose attention was attracted to the place during a visit in 1864, when he observed the destruction of the ancient remains. After much effort he induced the Berlin Museum to begin excavations in 1878, and when the third campaign, directed by Humann and A. Conze, closed in 1886, the upper Acropolis had been cleared, including the site of the altar and the library. In 1901 new explorations under W. Dörpfeld were begun on the lower slopes of the hill, with the avowed intention of recovering so far as possible the city of Eumenes. Besides the remains of the altar, already mentioned, important ruins of a Roman theatre, amphitheatre, and circus were found. The sculptures recovered are partly in Berlin, where the Great Altar has been set up in its old form, in the Kaiser Friedrich Museum, and partly in Constantinople.

Bibliography. Consult the article "Pergamon," in August Baumeister, *Denkmäler des klassischen Altertums* (Munich, 1887); J. L. Ussing, *Pergamus: seine Geschichte und Monumente* (Berlin, 1899); Pontemoli and Collignon, *Pergame* (Paris, 1900), with plates and

restorations; Humann and others, *Vorläufige Berichte über die Ergebnisse der pergamenischen Ausgrabungen* (Berlin, 1880, 1882, 1888); *Altertümer von Pergamon*, published by the Royal Museum (ib., 1890 et seq.); Karl Hachtmann, *Pergamon: eine Pflanzstätte hellenischer Kunst* (Gütersloh, 1900); Wilhelm Dörpfeld, *Führer durch die Ruinen von Pergamon* (Berlin, 1902); M. M. Honan, *Guide to the Pergamon Museum* (ib., 1904); Kaiserlich Deutsches Archäologisches Institut, *Mittheilungen: Athenische Abtheilungen*, vol. xxxiii (Athens, 1908); K. Baedeker, *Konstantinopel, Balkanstaaten, Kleinasien, Archipel, Cypern* (2d ed., Leipzig, 1914); the article "Pergamon," in Fr. Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., ib., 1914).

PERGAMON, GREAT ALTAR OF. A magnificent structure erected during the reign of Eumenes II (197-159 B.C.) in the market place at Pergamon and dedicated to Zeus Soter and Athena Nikephoros. The occasion of its erection was the defeat of the Gauls (the Galatians of the New Testament) by the people of Pergamon under Eumenes. See GALATIA.

This altar was discovered during extensive excavations carried on at Pergamon by the Germans, from 1878 on, first under the direction of Humann and Conze and later under that of Dörpfeld. The first indications of the existence of the monument, which is mentioned but once in ancient literature—unless the "throne of Satan" (Rev. iii. 13) refers to it—in Ampelius, *Liber Memorialis: Miracula Mundi*, xiv, were discovered when certain carved slabs of marble were found by Humann in the fortifications of the town. The discovery of these led eventually to the location of the monument itself in the market place at the southern end of the Acropolis.

The structure, now reerected in Berlin, consisted of an almost square podium (37.7 × 34.6 meters), which rested upon a few steps. Upon this podium rested a frieze 2.3 meters tall, which in turn was crowned by an Ionic cornice. The top of this base was inclosed on three sides by an Ionic colonnade, while the fourth side, by a flight of 24 steps cut out of this side of the base, gave access to the inclosed area on top of the monument in which stood the altar. See ALTAR.

The chief interest in the structure lies in the splendid frieze which decorates the base. Originally this sculptured band, over 7 feet in height, was 120 feet long; now but 80 feet remain. The subject represented is the battle of the Gods with the Giants, as symbolic of the Greeks defeating the Gauls, and in it the most furious action is displayed. A secondary frieze, depicting the story of Telephus, decorated the inside of the colonnade on the top of the monument. The work exhibits consummate workmanship combined with the academic insistence upon accuracy of detail so peculiar to the late Greek period of art. The work is the type *par excellence* of the Hellenistic age. Consult: *Altertümer von Pergamon*, published by the Royal Museum (Berlin, 1890 et seq.); Maxime Collignon, *Histoire de la sculpture grecque*, vol. ii (Paris, 1892); E. R. O. von Mach, *Greek Sculpture: Its Spirit and Principles* (Boston, 1903); Kaiserlich Deutsches Archäologisches Institut, *Mittheilungen: Athenische Abtheilungen*, vol. xxxiii (Athens, 1908).

PERGAMUM, PERGAMUS. See PERGAMON.

PERGAMUM, ORIBASIIUS OF. See ORIBASIIUS OF PERGAMUM.

PERGER, pēr'gēr, RICHARD VON (1854-1911). An Austrian composer, born in Vienna. He studied under Brahms; served in 1890-95 as director of a conservatory at Rotterdam, where he succeeded Gernsheim as conductor of concerts. In the latter year took charge of the Vienna Gesellschaftskonzerte, and two years later assumed also the direction of the Vienna Männergesangsverein. In 1899-1907 he was director of the Vienna Conservatory. His compositions include a comic opera, *Der Richter von Granada* (1889); a singspiel, *Die 12 Nothelfer* (1891); *Violin Concerto in C Minor* (1894); *Das stählerne Schloss* (1904). He also wrote an excellent biography of Brahms (1908).

PERGOLESI, pār'gō-lā'zē, or **PERGOLESE**, -lā'zā, GIOVANNI BATTISTA (1710-36). An eminent composer of the Neapolitan school, born at Jesi. In 1747 he was admitted into the Conservatorio dei Poveri di Gesù Cristo at Naples, where he studied the violin under Domenico di Matteis and composition under Gaetano Greco and Durante. Under the conviction that melody and taste were sacrificed to learning by most of the masters of his time, he abandoned the style of Scarlatti and Greco for that of Vinci and Hasse. His first great work was the oratorio of *San Gagliardo d' Aquitania*, composed in 1731. Two years later appeared his opera *La serva padrona*, which gained him universal fame and which has remained one of the finest examples of its genre; strangely enough, it was practically his only stage success. In the same year he composed *Il prigioniero superbo* and *Il frate innamorato*; in 1734, *Adriano in Siria*, in 1735, *Il Flaminio* and *L'Olimpiade*. In 1734 he received the appointment of *maestro di capella* of the church of Loreto. In consequence of delicate health he removed to Pozzuoli, where he composed the cantata of *Ofelio* and his pathetic *Stabat Mater*. Besides the above mentioned works Pergolesi composed a number of pieces for the Church, which were better appreciated during his lifetime than were his secular compositions, also a violin concerto, and 30 trios for violin, violoncello, and harpsichord. His works are all characterized by sweetness and freedom of style. His orchestration was particularly simple, confined chiefly to the strings, reinforced occasionally by the horns and trumpets. An undoubted reason for the contemporary failure of much of his operatic music was his innovation in style, wherein he abandoned the old contrapuntal accompaniments and supported his melodies and voices with harmonically written accompaniments. He died of consumption at Pozzuoli. Consult H. M. Schletterer, "Giovanni Battista Pergolesi," in *Waldersee's Sammlung*, No. 17 (Leipzig, 1880), and R. Barchiesi, *Il passaggio d'un genio. Giambattista Pergolesi* (Milan, 1911).

PERGOLESI, pār'gō-lā'zē, MICHEL ANGELO. An eighteenth-century Italian decorative designer and painter, who went to England to work in the architectural studio of Robert Adam. Furniture and a chandelier designed by him are illustrated on Plates 58-61 of Constance Simon's *English Furniture Designers* (London, 1905). The best opportunity, however, to study Pergolesi's style is afforded by his own *Designs for Various Ornaments on Seventy Plates* (London, 1777-1801). He designed not only furniture but silver plate, also paint and compo orna-

ments for walls and ceilings. His work is so like that of Robert Adam as often to be mistaken for it, but it is distinctly more French in feeling and nearer to what was done in Paris in the reign of Louis XVI. Details of Pergolesi's life are lacking.

PERI, pā'rē (Fr. *péri*, Pers. *pari*, *perī*, fairy, Pahl. *parik*, evil genius, Av. *parikā*, female demon). In Persian folklore, a class of fairies, both male and female, of surpassing beauty. In the old Iranian religion, on the other hand, the Peri was a female demon or enchantress of the utmost malignancy. Such a change of concept of a godling from maleficent to beneficent as is found in this instance is a rare phenomenon in comparative religion, although the transformation of the gods of one religion into the demons of another frequently takes place. The Peri play a prominent part in Moore's *Lalla Rookh* as well as in the musical compositions based on this poem by Schumann (*Das Paradies und die Peri*) and Bennett (*Paradise and the Peri*).

PERI, pā'rē, JACOPO (1561-1633). An Italian musician, the originator of the new declamatory style (*stilo rappresentativo*) which led to the establishment of opera. He was one of the musicians that met at the house of Bardi and Corsi, where the efforts to reconstruct the music to the Greek tragedies resulted in the evolution of a new recitative suited to dramatic declamation. In 1597 Peri applied the theories of his group in the composition of *Dafne* by Rinuccini, thus writing the first opera, which was produced the same year and received with immense enthusiasm. In 1600 he wrote *Euridice* on a text by the same poet. A few months later, within the same year, Caccini (qv.) composed the identical text, claiming to be the originator of the new style. Recent investigations, however, have established the priority of Peri's work beyond a doubt. Together with Monteverde he wrote *Ariadne* (1608). From 1600 till his death he was general music director at the court of Florence. He died in Florence. See CACCINI, OPERA.

PERIAGUA, pēr'ē-a'gwā. See PIRAGUE.

PERIANDER (Lat., from Gk. Περίαςδρος, *Periandros*). A tyrant of Corinth from about 625 to 585 B.C. He was a son and successor of the tyrant Cypselus. He was energetic as a warrior and distinguished as a patron of poetry and music and is by some reckoned as one of the Seven Wise Men of Greece; many wise maxims were ascribed to him. He was, however, cruel and despotic. He is said to have put to death his wife, Melissa, while his son Lycophron was sent to reside at Coreyra, which was then under Periander's rule. Later, when Periander, wishing to see his son, undertook to visit Coreyra, the Coreyreans, terrified at the prospect and hoping to avert the visit, put Lycophron to death. Periander, as tyrant, had under his sway, besides Corinth, also Coreyra, Ambracia, Leucas, and Anaclorum. Among other forms of literature he is said to have cultivated elegiac poetry especially. Psammetichus, son of Gordius, the last of the Cypselid dynasty, succeeded him.

PERIANTH (from Gk. περί, *peri*, around + ἄθος, *anthos*, flower). A general name of the sepals and petals of a flower and usually used when the two sets do not differ in appearance, as in a lily. See FLOWER.

PERIBLEM (from Gk. περίβλημα, *periblema*, cloak). The embryonic region near the growing

tip of stems and roots which lies outside of the pterome (q.v.) and develops into the cortex. In seed plants (spermatophytes) it is covered by the dermatogen, the embryonic layer which develops the epidermis; but in fern plants (pteridophytes) it forms the outside of the stem tip. See STEM.

PERIBONKA. A northern tributary of Lake St. John (q.v.), Canada, over 400 miles long.

PERICARDITIS (Neo-Lat., from *pericardium*, from Gk. *περικάρδιον*, *perikardion*, membrane around the heart, neut. sing. of *περικάρδιος*, *perikardios*, around the heart, from *περί*, *peri*, around + *καρδία*, *kardia*, heart). An inflammation of the membranous sac investing the heart—the pericardium (q.v.). This membrane is composed of two layers, the surfaces of which are normally in contact and secrete a thin serous fluid which acts as a lubricant and prevents irritation from the constant movement of the surfaces upon each other. The intervening space, which exists only in pathological conditions, is called the pericardial cavity. In common with all serous membranes (q.v.) the pericardium is subject to two varieties of inflammation—the dry or plastic form and that characterized by effusion of fluid. In the dry variety, which is most common and least dangerous, there is first a dulling of the surfaces involved, due to a fibrinous exudation, constant rubbing roughens these fibrin-coated surfaces; the plastic, sticky material is thrown into ridges or drawn out into shreds and presents a curiously shaggy appearance—the so-called *cor villosum* or hairy heart of the older writers. This form of pericarditis may terminate by absorption of the fluid, always leaving, however, an adhesion between the two layers; or the process may go on to the moist form—pericarditis with effusion. Here an extravasation of fluid occurs into the pericardial cavity amounting from a few drams to two quarts. This fluid is at first serofibinous or hemorrhagic, but in some cases becomes rapidly purulent. When the amount of fluid is considerable the heart's action is mechanically interfered with, and death may take place from this cause in a few days.

Pericarditis may arise from many causes. The primary form, unassociated with any other disease, is comparatively rare and occurs only in children. As a secondary process it is a common affection. Rheumatism is responsible for more than 50 per cent of the cases, septic processes in other parts of the body are frequent causes: tuberculosis, gout, Bright's disease, scurvy, diabetes, and the eruptive fevers such as scarlatina and typhoid may be complicated by it; and, lastly, it may take place by extension from neighboring structures, as in pleuropneumonia or septic endocarditis, or it may result from a wound.

The symptoms are precordial pain, palpitations, a dry cough and hurried respiration, discomfort or pain on lying on the left side, restlessness, great anxiety of countenance, and sometimes delirium. The pulse usually beats from 110 to 120 in a minute and is sometimes intermittent, and febrile symptoms are always present. Pericarditis may terminate fatally in 48 hours or less. In ordinary cases, however, which terminate in apparent recovery, the disease generally begins to yield in a week or 10 days and, excepting that adhesion remains, the cure appears to be complete in three weeks or

less. But although these patients apparently recover, the pericardial adhesion commonly occasions other structural changes of the heart sooner or later.

In this disease the patient must be kept absolutely quiet, so as to throw as little work upon the heart as possible. In the early stages and in robust people leeches may be applied over the pericardial area, or ice bags may be used to limit effusion. When effusion has taken place a blister will sometimes cause it to be absorbed. In suitable cases diuretics may be given to promote the action of the kidneys, and mild purgation will be of service. When the effusion is so extensive as seriously to embarrass the heart's action, it may be drawn off by paracentesis (q.v.). If the fluid be purulent, however, an incision must be made into the sac, through the chest wall, and the cavity drained. See HEART, DISEASES OF THE.

PERICARDIUM (Neo-Lat., from Gk. *περικάρδιον*, *perikardion*, membrane around the heart). A conical membranous sac, containing the heart and the commencement of the great vessels, to the extent of about 2 inches from their origin. It is placed with its apex upward behind the sternum, and to its left side, in the interval between the pleura, the serous sacs in which the lungs are inclosed; while its base is attached to the diaphragm. It is a fibroserous membrane, consisting of an external fibrous and an internal serous layer. The fibrous layer is a strong, dense, fibrous membrane, the serous layer invests the heart, and is then reflected on the inner surface of the fibrous layer. Its inner surface is smooth and glistening and secretes a thin fluid which serves to lubricate the pleural surfaces. Inflammation of this serous sac constitutes the disease known as pericarditis. See HEART, PERICARDITIS.

PERICARP (from Gk. *περικάρπιον*, *perikarpion*, pod, from *περί*, *peri*, around + *καρπός*, *karpós*, fruit). The transformed wall of the ovary in the fruit. For example, a pea pod without the peas is the pericarp. See FRUIT.

PERICLES, *pér'iklēs* (Lat., from Gk. *Περικλῆς*, *Periklēs*) (? 429 B.C.). The greatest statesman of ancient Greece. His father was Xanthippus, victor over the Persians at Mycale in 479 B.C. His mother was Agariste, the niece of Cleisthenes, the lawgiver. He received a careful education and was especially influenced by two of his teachers, Damon, a famous sophist and master of music, and the philosopher Anaxagoras of Clazomenae, to whose teaching he undoubtedly owed the independence of thought and freedom from superstition which raised him above the multitude. Throughout his life Pericles was conspicuous for his singular dignity and aloofness. He avoided convivial gatherings and seldom walked abroad among his fellow citizens. But his eloquence, sagacity, uprightness, and patriotism won recognition from a large part of the Athenians, and for more than 30 years he was the most influential leader in Athens. When he entered on public life Aristides had only recently died. Themistocles was an exile, and Cimon was engaged in fighting abroad. Pericles from the first attached himself to the democratic party, and under his leadership the complete democratization of Athens was accomplished. Hitherto only the nobler and richer elements in the state had had access to the higher offices, but under his direction all offices were eventually opened to the entire body of citizens. The

first step in this new course was the limitation of the functions of the Areopagus, at that time the chief court at Athens. Through the agency of Pericles' associate, Ephialtes, in the year 462-461 measures were passed which deprived the Areopagus (q.v.) of all its important political powers. To it were left jurisdiction only in cases of homicide, the care of the sacred olive trees of Athena, and a share in the supervision of the land sacred to the Eleusinian divinities. Its former functions passed to the Athenian Senate of 500, the popular assembly, and the law courts. Pay for archons was introduced, and later all officials received a salary for their services. About 458 the third class of citizens, the Zeugitae, were made eligible to the archonship, and it cannot have been many years before this office was open to all, even the lowest citizens. Furthermore, the members of the Senate were now chosen absolutely by lot from the entire body of Athenians. Thus in a few years after Pericles became prominent most important constitutional changes were carried through at Athens. The opposition of Cimon had been avoided by his ostracism (q.v.). Pericles' foreign policy seems to have been based on a desire to extend the power and influence of Athens as widely as possible over the Greek states, and he confidently hoped to consummate an Hellenic league which should embrace all Greek states. His attempt to hold a congress for this latter purpose in 448 was unfortunately defeated.

The Athenians, elated by their victories over the Persians and fired by the splendid empire established under the name of the Confederacy of Delos (see *DELOS*), were eager for foreign conquest. As their naval empire grew and their trade increased, they came into rivalry with Corinth and Aegina. In 460 they had seized Megara, an act which led to war with the Spartans, and during the next four years Athens successfully resisted the attacks of Corinthians and Spartans, and in 459-456 reduced Aegina, which was made a tributary member of the Confederacy of Delos. Athens had seized Naupactus also, which gave her a naval station by which she could command the Corinthian Gulf. She also extended her conquest to the north, and by the battle of Oenophyta (457) gained the greater part of Boeotia, only to lose it again 10 years later by the battle of Coronea. The war with Persia had continued in the East under the direction of Cimon, who had been recalled at Pericles' suggestion. After Cimon's death in 449 Pericles seems to have thought the struggle against Persia too severe a tax on Athens if she was to continue her efforts against her rivals in Greece, and so in 448 a peace was concluded with the Persians. Athens was now free to attend to her cares at home. She had gradually extended her territory so that, aside from her allies on the mainland, she embraced, under the Confederacy of Delos, as equal or subject allies, nearly all the larger islands of the Aegean, and she furthermore possessed important cities in the north and in the Thracian Chersonese. In 446-445 a 30 years' peace was concluded between Athens and her allies on the one side and the Peloponnesians and their allies on the other. There was, however, strong opposition to Pericles' policy. The party opposed to him was led by Thucydides, whose ostracism in 444 left Pericles the undisputed leader. He apparently had the power to persuade the people to do whatever he thought good, and for 15 years after his

opponent's ostracism he was annually elected to the office of general. Under his direction Athens had been made supreme within her naval empire, and his purpose was to aggrandize Athens even at the expense of her subject states. With the great wealth which came to her treasury Pericles restored the temples destroyed by the Persians and erected new monuments which made Athens the most magnificent city of the ancient world. Most prominent among these monuments were the bronze statue of Athena Promachos, which was erected about 448 at the west end of the Acropolis, and a new temple to Athena Polias. The Parthenon (q.v.) was also built on an enlarged and more magnificent scale. At the west entrance to the Acropolis a new propylaeum was erected; on a projection at the southwest corner of the Acropolis the temple of Athena Nike was built. The city was also adorned with many other temples and monuments. In the period of Pericles' leadership Athens became a great centre of literature as well as of the fine arts, and philosophy was also transplanted from Ionia and Italy to the soil of Athens, which was destined to be its home for a thousand years. Pericles was not only a great political leader, but was also able in the field, as was shown by his successful reduction of the revolt of Samos in 439.

Athens's prominence at length made her an object of jealousy. In 433 she formed an alliance with Coreyra, a recalcitrant colony of Corinth, and in the winter of 432-431 the Peloponnesians under the leadership of Sparta decided on war against Athens. Pericles summoned the country residents of Attica within the walls of Athens, and allowed the Peloponnesian army to harry the country at will during the summers of 431 and 430. In the latter year plague broke out in the city and caused many deaths and great dejection. Pericles was deposed from his office, tried, and fined, but soon reinstated through a revulsion of feeling. In the following year he died after a lingering sickness. While Pericles undoubtedly contributed greatly to Athenian brilliancy, his imperialistic schemes made the Peloponnesian War inevitable. (See *ASPASIA*.) Consult: Thucydides, chap. ii, 1-65; the histories of Greece, especially those by Grote, Abbott, Curtius, Holm, Busolt, and Meyer; Edmond Filleul, *Histoire du siècle de Périclès* (Paris, 1873); W. W. Lloyd, *The Age of Pericles* (2 vols., London, 1875); Adolf Schmidt, *Das Perikleische Zeitalter* (Jena, 1877-79); Evelyn Abbott, *Pericles and the Golden Age of Athens* (New York, 1891); J. B. Bury, *Ancient Greek Historians* (New York, 1909). See *GREECE, History, Ancient History*; *GREEK ART, The Temple and II, (b) Age of Phidias*; and *Plate of GREEK ART*.

PERICLES, PRINCE OF TYRE. A play remodeled by Shakespeare, probably from one by George Wilkins and Rowley, and produced about 1607. It was printed in 1609, but is not in the folio of 1623. The earliest form of the story is Greek in the sixth century. Gower introduced it as "Apollonius of Tyre" in the *Confessio Amantis* (1332). Shakespeare's part is evidently acts iii, v, and partly iv.

PERICYCLE (from Gk. *περίκυκλος*, *periky-klos*, all around, spherical, from *περί*, *peri*, around, + *κύκλος*, *kyllos*, circle). A sheath of more or less active cells in vascular plants forming the outer layer of the stele (q.v.), within which the vascular cylinder is developed. It is

usually continuous and of a variable number of cells in depth, but in rare cases it is lacking entirely. It abuts against the innermost layer of the cortex (q.v.), which is called the endodermis. In roots it is usually the pericycle which gives rise to the endogenous branches.

PERIDINIUM. See RED WATER.

PERIDOT, pĕr'i-dōt (Fr. *péridot*, of unknown etymology). A variety of chrysolite used as a gem. It is usually of an olive, pistachio, or leek-green color. It is found in abundance and of good quality in the form of small, olive-green, pitted grains or pebbles, especially in the sands of Arizona and New Mexico, where they are called locally Job's tears. The best quality for gems comes from the Levant. See CHRYSOLITE.

PERIDOTITE, pĕr'i-dō-tit. An igneous rock of ultrabasic composition, essentially free from quartz and feldspar, but consisting mainly of olivine and of one or more of the following minerals: augite, hypersthene, hornblende, magnetite, and rarely biotite. The peridotites are sometimes known as the magnesian rocks (see also PERKNITE), and as they are poorest in silica and richest in magnesia of all terrestrial rocks, they form a connecting link with celestial (meteoritic) bodies. From the family of the pyroxenites peridotites differ chiefly by containing olivine. Usually of small extent, they occur as more basic masses within areas of gabbro (q.v.) and norite. By processes of weathering, of which evidence is rarely lacking in specimens, peridotites alter to serpentine (q.v.); most of the larger bodies of the latter rock have been derived from peridotites.

PÉRIER, pâ'ryá', CASIMIR (1777-1832). A French statesman, born at Grenoble, Department of Isère, Oct. 21, 1777. He was educated at the College of the Oratory at Lyons, and served in the Army of Italy during the campaigns of 1798-1800. Returning to Paris, he helped his father and brother to found a banking house, which soon had a large and prosperous business. In 1817, as the result of an attack on the financial policy of the government, Casimir Périer was chosen as one of the Deputies from Paris, and being repeatedly reelected, he became one of the leading members of the Opposition under Charles X. In 1828 he was Minister of Commerce and Finance under Martignac. After the overthrow of the Bourbon monarchy by the revolution of July, 1830, Périer became a member of the new government and acted as Prime Minister to Louis Philippe from March 13, 1831, until his death, May 16, 1832. During his tenure of office he repressed Republican outbreaks at Paris and at Lyons and the Legitimist movement in the South. He also directed the foreign policy of France against Austria with sagacity and ability, and sustained ministerial responsibility against the King and in the Chamber of Deputies. In his efforts to control the cholera epidemic of 1832 he became infected with the disease and rapidly succumbed. The most prominent disciple of his constitutional policy of *juste milieu* was Guizot, who has given a picture of his predecessor in his *Mémoires*. Périer's son, Auguste, adopted the name of Casimir-Périer (q.v.).

PÉRIERS, pâ'ryá', JEAN BONAVENTURE DES (c.1500-44). A French poet and philosopher, born at Arnay-le-Duc, Bourgogne. His known literary work began in 1534 with collaboration in the first French translation of the Bible, and

two years afterward he assisted Dolet in his *Commentaires de la langue latine*. He entered into the service of Marguerite, Queen of Navarre (1536), but in the following year fell out of favor with her on the publication of his *Cymbalum Mundi*, a collection of allegorical dialogues, wherein man's philosophy and religion are ridiculed. The book, denounced by Catholic and Protestant alike, was publicly burned, its author ostracized, and it is supposed that he committed suicide. His friends published *Œuvres diverses* (1544) and the *Nouvelles récréations et joyeux devis* (1558). A later edition of his works was published in Paris (1866) and a special one of the *Cymbalum* in 1874.

PERIGEE, pĕr'i-jĕ (from Gk. *περί, peri*, around + *γῆ, gē*, earth). That point in the moon's orbit which is nearest to the earth. The opposite point is the apogee (q.v.). See MOON.

PÉRIGORD, pâ'rĕ'gôr'. A former county of France, forming a part of the Province of Guienne (q.v.), and now included within the Departments of Dordogne and Lot-et-Garonne. It was divided into Upper and Lower Périgord, and the principal town was Périgueux. It was the land of the ancient Petrocorii; was overrun by the Franks in the beginning of the sixth century, and with the rest of Guienne came into the possession of England by the marriage of Henry II and Eleanor of Aquitaine. In 1454 it was acquired by the house of Albret, and upon the accession of Henry IV in 1589 was united to France.

PÉRIGORD, CHARLES MAURICE, DUKE DE TALLEYRAND-. See TALLEYRAND-PÉRIGORD, C. M., DUKE DE

PÉRIGUEUX, pâ'rĕ'gô'. The capital of the Department of Dordogne, France, on the Isle, 79 miles east-northeast of Bordeaux (Map: France, S. E 3). It consists of the ancient cité of Périgueux, along the river bank—gloomy of aspect, with narrow streets, but large and solidly built houses—the Puy Saint-Front on rising ground, which until 1240 was a separate town, and the new town. In the old town there are many curious remains of ancient and mediæval architecture, including a château of the fourth century. The ramparts have been demolished and replaced by boulevards. The cathedral of Saint-Front, dating from 1120, a majestic edifice of Byzantine design in the form of a Greek cross, with five domes, externally reconstructed since 1865, resembles St Mark's at Venice. Other interesting features are the former cathedral of Saint-Etienne, the remains of a sixth-century basilica, and the ruins of a vast Roman amphitheatre, of ancient aqueducts, baths, temples, and the remarkable Tour de Vésone. The city has a museum of antiquities, a library with 35,000 volumes, a botanical garden, and a handsome seminary. Quarries of building stone are worked in the vicinity, and many hands are employed in cutting and polishing marble. Paper, woolen cloths, silk, cutlery, hats, furniture, agricultural machinery, tools, and tobacco are manufactured and there is a trade in wine, grain, swine, and oxen. The celebrated pâtés de Périgueux, made of partridges and truffles, are largely made and exported. Pop., 1901, 31,976. 1911, 33,548. Périgueux, the Vesunna and capital of the Petrocorii, mentioned by Caesar, was a city of much importance in ancient times. See PÉRIGORD.

PERIGYNY, pĕr-ij'i-nĭ (from Gk. *περί, peri*, around + *γυνή, gynē*, woman, pistil). A condition in flowers in which the sepals, petals, and stamens are borne upon the margin of a cuplike outgrowth around the pistil, as is well shown in the flower of the common cherry. In most flowers the different sets of members arise independently (hypogyny, q.v.), but in perigyny zonal development occurs, involving the three outer sets. The different sets start independently, but sooner or later a common growth of all their zones occurs, resulting in an urnlike structure bearing the distinct members at its rim and inclosing the carpels. Epigyny (q.v.) is a floral condition in which all four floral sets have a common zonal development, resulting in the so-called inferior ovary. Perigynous flowers are specially characteristic of certain genera of the rose family. See FLOWER; HYPOGYNY; PERIGYNY.

PERIHELION (Neo-Lat., from Gk. *περί, peri*, around + *ἥλιος, hēlios*, sun) That point in its orbit at which a planet is nearest the sun. The point of the orbit opposite to it is called the aphelion (q.v.). The position of the perihelion, i.e., its longitude east or west of the vernal equinox, is one of the seven elements of a planet's orbit. See ELEMENTS; ORBIT.

PERIM, pā-rēm' A small island in the Red Sea about 2 miles from the southwest coast of Arabia, in the Strait of Bah-el-Mandeb (Map: Asia, F 7). Area, about 7 square miles. It is under British control, being annexed in view of increasing importance of the Red Sea, is used as a coaling and supply station, and has a small garrison and a lighthouse. Pop., about 200.

PERIMETER (Lat. *perimetros*, from Gk. *περίμετρος*, circumference, from *περί, peri*, around + *μέτρον, metron*, measure). The length of the boundary of a plane figure. In the case of curvilinear figures, and particularly of circles, the word circumference is generally used instead of perimeter. See ISOPERIMETRIC FIGURES.

PERINÆUM (Neo-Lat., from Lat. *perinaeum*, *perineum*, from Gk. *περίναιον, perinaion*, *περίνεον, perineon*, *περινός, perinos*, perineum). The part of the human body which forms the floor of the true pelvis is by anatomists divided into two portions. Of these the anterior one, situated in front of the anus, is called the true perinaeum, or urethral (or, in the female, the vaginal) portion of the perinaeum, the posterior portion, which contains the anus or termination of the rectum, is called the rectal or anal portion of the perinaeum. The anterior portion, or true perinaeum, is triangular in form, the apex being in front; the sides, about 3 inches in length, are formed by the rami of the pubes and ischium (see PELVIS), and the base by an imaginary line joining the tuberosities of the ischium and passing about ½ inch in front of the anus. Through this space the urethra passes through a layer of strong fascia—the deep perineal fascia—to communicate with the bladder, and in this space the opening is made in the operation of lithotomy.

In the female the space usually referred to as the perinaeum lies between the vagina in front and the anal orifice behind. Its most important constituent is the anterior portion of the levator ani muscle. The perinaeum, including a greater or less extent of this muscle and sometimes also the sphincter ani muscle, is often torn during parturition, and requires suturing for its repair.

PERIOD (Lat. *periodus*, from Gk. *περίοδος*, a going round, circumference, circuit, cycle, sen-

tence, period, from *περί, peri*, around + *ὁδός, hodos*, road). A term used in chronology in the same sense as cycle, to denote an interval of time after which the astronomical phenomena to which it refers recur in the same order. It is also employed to signify a cycle of cycles.

The Chaldeans invented the *Chaldaic period* or *Saros*, from observing that, after a certain number of revolutions of the moon round the earth, her eclipses recurred in the same order and of the same magnitude. This period consists of 223 lunations, or 6585.32 days, and corresponds almost exactly to 19 "eclipse years." The eclipse year is the time required for the sun, in his apparent motion among the stars, to complete a circuit from one of the nodes (see NODE) of the lunar orbit back again to the same node. On account of the motion of the lunar nodes, the eclipse year contains only 346.62 days, and 19 such years contain 6585.78 days. The error of the *Saros* is thus only 0.46 day (about 11 hours) in 223 lunations, or 19 eclipse years.

Various important periods or cycles are used in the calendar (q.v.) for predicting the dates of new and full moon. These phases recur on the same dates every 19 years (except that leap years may change the dates one day), which fact was discovered by Meton, an Athenian, who invented (432 B.C.) a lunar period of 6940 days, or 19 years, called the *Metonic cycle* (q.v.), also the *lunar cycle*. The *calypic period* consists of 76 years, or four Metonic periods, and is thus able to take account of leap years. The period of the *lunar* or *solar cycle*, after which the same day of the month falls upon the same day of the week, consists of 28 Julian years of 365¼ days each. If the year had regularly consisted of 365 days—i.e., one day more than an exact number of weeks—it is evident that at the end of seven years the days of the month and week would again correspond; but the introduction of an intercalary day into every fourth year causes this coincidence to recur at irregular periods. (To ascertain when the same days of the week and month will recur in the Gregorian calendar, see CALENDAR, *Perpetual Calendar*.) The *Julian period* is a cycle of cycles and consists of 7980 (28·19·15) years, after the lapse of which the solar cycle, lunar cycle, and the indiction (q.v.) commence together. The time of its commencement was arranged so that it will expire at the same time as the other three periods from which it is derived. The year 4713 B.C. is taken as the first year of the period, consequently 1 A.D. is the 4714th year of it. (See CHRONOLOGY; CALENDAR, CYCLE.) Astronomers also use the term "period" to designate the time required by a planet or other celestial body to complete a revolution in its orbit. (See ELEMENTS.) In this sense there may be different periods for the same body, according to the point selected as the beginning and end of the periodic orbital motion. The location of the position from which the motion is supposed to be viewed may also change the period materially.

PERIODIC ACID. See IODINE.

PERIODICAL. In a wide sense, a publication issued, at more or less regular intervals, in successive numbers, which are not related to one another as volumes or parts of a single book or series of books. The word, however, is commonly employed—and is here considered—in a narrower sense which excludes on the one hand newspapers (see NEWSPAPER), or periodical summaries of current and especially of political

events, and on the other such periodical publications as the transactions of learned societies, yearbooks, almanacs, and so on. Even within these limits the term includes a great variety of publications which differ so much in object and character that concise description of them is impossible, but it may be said of them in general that they are designed to furnish either information about matters of more than ephemeral interest or entertainment, or both. They deal either with a single subject—such as literature, or a particular science or industry—or with a group of allied subjects, or with material of the most heterogeneous character. The most important special groups of them are *revues*, or periodicals devoted especially to the criticism of books, and *magazines*, which are designed to furnish miscellaneous and entertaining reading. In the most popular of the latter class fiction forms an important part of the contents, and pictorial illustrations, often of fine artistic quality, are frequently employed.

Early Forms. The periodical, as thus defined, originated in France in the seventeenth century and in the form of the critical literary journal. The first suggestion for it may perhaps be found in Théophraste Renaudot's *Bureau d'Adresse* (1633-42), which was no more than an account of his conferences concerned with literature and science, but the first real example of it was the *Journal des Savants*, which turned out to be one of the most famous and longest lived, for its publication has continued, though with many interruptions, until the present day. The idea which it embodied was conceived about 1663 by the historian Mezeray, who proposed to establish a weekly journal in which should be "made known what was happening in the republic of letters." His project came to nothing, but in 1664 Denis de Sallo, Sieur de la Coudraye, under the name of Sieur de Hédouville, obtained the privilege of issuing a periodical of this kind, and the first number of the *Journal des Savants* appeared on Jan. 5, 1665. Its plan included reviews of new books, reports of scientific discoveries, obituary notices, and general information of interest to the learned world. Sallo associated with himself a number of scholars, among them the Abbé Gallois, who succeeded him as editor. The freedom—or, as it appeared to an age not accustomed to the ways of the reviewer, arrogance—with which the new journal criticized both books and (what was more serious) ecclesiastical affairs promptly brought it into trouble, and after the appearance of the thirteenth number it was suppressed. Colbert, however, who recognized its value, decided to reestablish it, and, on Sallo's refusal to consent to the demanded abridgment of his freedom, placed it (1666) in the hands of the Abbé Gallois, who conducted it negligently, issued it very irregularly, and practically abandoned it in 1674. In 1675 publication was resumed under the editorship of the Abbé de la Roque, who was succeeded in 1687 by L. Cousin. In 1701 it was acquired for the state and passed under the editorial control of a commission of literary men and was conducted in this way until 1723. After a year of suspended animation it was reissued under the auspices of the Abbé Bignon and the Abbé Desfontaines. Another interruption of publication was caused by the Revolution in 1792, and an attempt to revive it in 1796 was a failure. It was finally reestablished (April 15, 1816) under the Restoration and placed under

the supervision of a commission representing the different classes of the Institute. In 1857 its control was put in the hands of the Minister of Public Instruction. The subsidy which had long been granted it by the state was withdrawn in 1903, and the Institute allowed 10,000 francs annually for its maintenance and nominated a commission of five members to control it. After 1909 the Académie des Inscriptions et Belles Lettres directed the *Journal*, which still received its 10,000 francs a year. It now accepts contributions concerned almost exclusively with antiquities, mediæval subjects, and Oriental subjects. Seven years after the appearance of the *Journal des Savants* was founded the second French literary, or partly literary, periodical, the *Mercurie Galant* of Jean Donneau de Vizé, which under a variety of titles continued, with interruptions, to exist until 1825, in 1717 it received the name of *Mercur de France*, by which it is commonly known. In addition to criticism, poetry, and other literary material, it dealt with topics of the most diverse kinds, including current news, and it has accordingly a place in the history of journalism. Among its editors were Thomas Corneille, whom Vizé associated with himself, and Marmontel. In the same year (1672) with the founding of the *Mercurie Galant* Claude Blondeau and Gabriel Guéret began the first legal periodical, the *Journal du Palais*, in 1679 appeared the *Nouvelles découvertes sur toutes les parties de la médecine* (3 vols.) of Nicholas de Blegny—memoirs published by an "academy" at whose head Blegny had placed himself—which may be regarded as the first medical journal, and in 1680 was issued by the Abbé Jean-Paul de la Roque the first prospectus of a religious periodical—the *Journal Ecclésiastique*. The publication of the last named was forbidden, and in 1690 La Roque began the *Mémoires sur l'histoire ecclésiastique*, of which however, only one volume was issued. A medical journal—*Les Journaux de Médecine, etc.*—which he started in 1683 was equally unfortunate. Other notable periodicals of French origin (but printed in Holland) dating from the seventeenth century are the *Nouvelles de la République des Lettres*, founded by the celebrated Pierre Bayle in 1684, and conducted by him for three years (it survived until 1718) the *Histoire des Ouvrages des Savants* of Henri Basnage de Beauval, begun in 1687 and continued until the middle of 1709, and the *Bibliothèque Universelle et Historique* of Jean Leclerc, the noted critic, which was issued in 1686-93.

Beginnings in England. The last quarter of the same century saw the beginnings of the literary and of the scientific periodical in England also. As the first example of the former is commonly reckoned the *Mercurius Librarius, or a Faithful Account of All Books and Pamphlets*, the first number of which appeared in April, 1680. It was announced as a "catalogue" to be published "weekly, or one in fourteen days at least," and it was in fact nothing more, it contained advertisements, or paid notices of new books, and possessed nothing of the literary character. Of greater importance was the *Weekly Memorials for the Ingenious*, issued 1681-83, which obtained much of its material from the *Journal des Savants*. Between 1685 and 1700 appeared for brief periods several learned publications of the periodical type, derived chiefly from continental sources. Of a more

strictly English character was the *Athenian Gazette* (later called the *Athenian Mercury*)—a kind of "Notes and Queries"—published weekly from March, 1689–90, to February, 1695–96, by the bookseller John Dunton, with the assistance of Richard Sault and others. The *Gentleman's Journal*, or the *Monthly Miscellany*, of Peter Anthony Motteux, a forerunner of the modern literary magazine, was issued 1692–93 (2 vols.); it contained verses by Prior, Sedley, Mrs. Behn, Oldmixon, D'Urfey, and others, and miscellaneous prose. The *History of the Works of the Learned*, a review dealing mainly with continental books, was issued from 1699 to 1712. Its publication was resumed in 1737 and was continued until 1743.

Early German Periodicals. In Germany a beginning was made in 1663 with the *Erbauliche Monatsunterredungen* of Johann Rist, which was followed in 1670 by the first scientific annual, the *Miscellanea Curiosa Medico-Physica* of the Academia Leopoldina-Carolina. But the most celebrated of all the periodicals which date from this period is the first German literary journal, the *Acta Eruditorum Lipsensium* (written in Latin), founded by Prof. Otto Mencke in Leipzig, the first number of which appeared in 1682. It was modeled after the *Journal des Savants* and the Italian *Giornale de' Letterati* (see below), and included extracts from, and analyses of, new books, reviews, and independent articles. Mencke associated with himself in this work many of the most learned men of the time, among them Leibnitz, Seckendorff, and Thomasius, and the *Acta* became the supreme critical authority in German literature. On Mencke's death, in 1707, he was succeeded in the editorship by his son, J. B. Mencke; and in 1732 his grandson, F. O. Mencke, began a new series under the title *Nova Acta Eruditorum*.

Outside of the countries above mentioned, Italy alone has possessed learned periodicals dating from this period—the *Giornale de' Letterati* of Francesco Nazzari, founded in 1668 and published until 1679, another with a similar title issued from 1686 to 1697 by Bacchini and Roberti, and the *Biblioteca volante* of Cinelli and Sancassini (1676–1718 and 1733–47).

Modern British Periodicals. From the beginning of the eighteenth century new periodicals have appeared in these and in other countries in ever increasing numbers and diversity. In England Daniel Defoe began in 1704 *A Review of the Affairs of France and of All Europe, as Influenced by that Nation*, issued at first weekly, then twice, and later thrice a week. It came to an end, in its original form, in 1712, but was carried on in a new series, called simply the *Review*, until June, 1713. One feature of this review—the contributions of an imaginary "Scandal Club"—doubtless suggested the periodical essay which became important in the history of English literature. Of these essay periodicals the most noted are the *Tatler* (1709–10–11), written chiefly by Steele and Addison; the *Spectator* (1710–14) of Addison, Steele, Budgell, and others; the *Rambler* (1750–52) of Dr. Johnson. A French Protestant refugee, Michel de la Roche, a friend of Bayle, started in 1710 the *Memoirs of Literature*, a review, independent of foreign sources for its material, though modeled after French works of the kind, which he issued until the end of 1714. In 1725 he began another review, the *Nec Memoirs of Literature*, which lived for about two years, and

in 1730 *A Literary Journal*, a continuation of the *Memoirs of Literature*, which came to an end in about half that time. A classical periodical, entitled *Bibliotheca Literaria, Being a Collection of Inscriptions, Medals, Dissertations, etc.*, was brought out in 1722 by Samuel Jebb and ran through 10 numbers, ending in 1724. La Roche's work was taken up by Andrew Reid, who issued (1728–36) *The Present State of the Republick of Letters*, a review of considerable merit; and by Archibald Bower, whose *Historia Literaria* appeared monthly (1730–34). At this time (January, 1730–31) was published the first and one of the most famous of English magazines, the *Gentleman's Magazine, or Traders' Monthly Intelligencer . . . by Sylvanus Urban, Gent.*, founded by the printer Edward Cave. His original plan, afterward much widened, was that of a collection or "magazine" (the first use of the word in this sense) of the essays and news which appeared in the London papers: the title was in other points suggested by Motteux's periodical mentioned above. The magazine met with great success—due chiefly to Cave's energy and practical (not literary) ability—its circulation rising within a few years to over 10,000 copies. In it, in 1732, was begun the publication of parliamentary debates (of both Houses), under the (necessary) disguise of "Reports of the Debates of the Senate of Lilliput"; Johnson was employed during several years in writing out (largely from his own imagination) the speeches reported. After Cave's death, in 1754, it was conducted by his brother-in-law and later by John Nichols and his son. In 1868 it became a magazine of light literature. It soon had numerous imitators and rivals, the most successful of which was the *London Magazine* (1732–84), established by leading London publishers. Among the most important of the other magazines established during the eighteenth century are the *Scots Magazine* (1739–1817, from that date to 1826 the *Edinburgh Magazine*), the *Royal Magazine* (1759–71), the *Oxford Magazine* (1768–82), the *European Magazine* (1782–1826), the *Monthly Magazine* (1796–1843), and the *Philosophical Magazine* (established 1798). To return to reviews: the *History of the Works of the Learned* found a successor in *A Literary Journal* (Dublin, 1744–49), the first review published in Ireland. *The Muscum*, projected by the poet and bookseller Robert Dodsley, appeared in March, 1746, and was issued fortnightly until September, 1747. It was as much a magazine as a review, comprising, besides notices of books, essays, mainly upon historical and social topics, by writers of repute, including Spence, Warburton, Horace Walpole, Akenside, and Campbell. From this time on the distinctive characteristics of the modern literary review became more and more prominent and before the end of the century were firmly established.

A notable advance in this direction was made in the *Monthly Review*, founded by Ralph Griffiths (1749) and conducted by him until his death, in 1803. It included scientific and literary material as well as criticism, and among its writers (1757–58) was Oliver Goldsmith. The *Review* was carried on after Griffiths's death by his son (until 1825) and others until 1845. The Whig politics and nonconformity of Griffiths led to the founding of the *Tory Critical Review* (1756–1817) by Archibald Hamilton, to which Smollett, Johnson, and Robertson contributed;

and this was followed by a number of others, including the *London Review* (1775-80); *A New Review* (1782-86); the *English Review* (1783-96), combined in 1797 with the *Analytical Review* (1788-99); the *Antijacobin Review and Magazine* (1798-1821); and the *High Church British Critic* (1793-1843), begun by Nares and Beloe. An epoch in the history of the English review was made by the establishment of the *Edinburgh Review or Critical Journal*—"to be continued quarterly"—the first number of which appeared in October, 1802. It was designed to be the organ not only of literary but also of political (Whig) opinion, and was planned so broadly and edited so ably that it almost immediately attained a position of authority which soon became, as Carlyle said, that of "a kind of Delphic oracle and voice of the inspired for great majorities of what is called the 'intelligent public.'" The first of the really great English reviews, it established a standard of reviewing which (though its literary criticism, especially in the early days, has often been inferior) its rivals during the century and more of its existence have not been able to surpass. In it the English review became for the first time a really potent influence in the formation of literary taste and the shaping of political views. Its original projector was Sydney Smith, and he also edited the first number, with the second the editorship was transferred to Francis Jeffrey (later Lord Jeffrey), who retained it until 1829, when he resigned on his election as dean of the faculty of advocates. Among the other earlier contributors were Brougham, who largely determined its political opinions, Scott (during the first few years), Carlyle, Hazlitt, and (from 1825) Macaulay, whose influence upon its character was probably second only to that of Jeffrey. After Jeffrey's retirement the editorship was held successively by Macvey Napier (1829-47), William Empson (-1852), George Cornewall Lewis (-1855), Henry Reeve (-1895), and Arthur S. Elliot (1895-). In 1902 the *Review* celebrated its centennial.

The great success and rapidly growing influence of this champion of Whiggism caused the Tories to bestir themselves, and in February, 1809, appeared the first number of the *Quarterly Review*, which soon attained a position hardly second to that of its great rival. Its first editor was William Gifford, and among its first contributors were Scott, Southey, Dr. Young, Canning, John Wilson Croker, and Heber. Gifford resigned in 1824 and was succeeded by John Taylor Coleridge, who gave place in 1826 to John Gibson Lockhart, who retained the editorial control of the *Review* until 1853, he was followed by the Rev. Whitwell Elwin (-1860), William Macpherson (-1867), Sir William Smith (-1893), Rowland Prothero (1894-99), and George W. Prothero (1899-). The *Westminster Review* (styled from 1836, when it was combined with the *London Review*, until 1851 the *London and Westminster Review*) was founded in 1824 to promulgate the views of the Utilitarians, Bentham and the Mills. The great quarrelles above mentioned were partisan in their origin and in their principles of editorial management; they were designed to promulgate definite views, literary and political, with which the opinions of their contributors must be in harmony; their articles were accordingly anonymous. This policy was abandoned by the *Fortnightly Review*, established in 1865 (issued

monthly from 1866), which was designed to allow the freest expression of individual opinion with individual responsibility. Its first editor was George Henry Lewes, who was followed in 1867 by John Morley, who resigned in 1882 and was, in turn, succeeded by T. H. S. Escott, Frank Harris, Oswald Crawford, and W. L. Courtney. Among its early supporters were Bagehot, George Eliot, Mill, Huxley, and Spencer. The policy of the *Fortnightly* has been followed by the *Contemporary Review*, established in 1866, the *Nineteenth Century* in 1877 (since 1900 *The Nineteenth Century and After*), and the *National Review* in 1883. A notable periodical also is the *English Review* (1908-), which took the name of a periodical that died more than a century before the founding of its later namesake.

Among weekly journals dealing wholly or partly with literature, science, and art are the *Examiner* (1808-81), the *Literary Gazette* (1817-62), the *Athenaeum* (1828-), the *Spectator* (1828-), the *Saturday Review* (1855-), the *Academy* (1869-), and the *Speaker* (1890-). The humorous weekly *Punch*, the most famous journal of its kind, was founded in 1841. Many notable English writers and artists have contributed to it.

Hardly less notable than the development of the review during the nineteenth century was that of the magazine. The *New Monthly Magazine* (1814) numbered Campbell, Theodore Hook, and Bulwer Lytton among its editors. A brilliant production was *Blackwood's Edinburgh Magazine* (1817-), which "created a sensation unparalleled in magazine history," due to the wit and audacity of its anonymous contributors, among whom were Lockhart, Hogg, Scott, and John Wilson the editor. Its most important feature, in those early days, was the famous *Noctes Ambrosianae*, "in which the leading contributors discoursed with irresponsible wit and incisiveness upon the books, the people, and the events of importance in their day." *Fraser's Magazine* (1830-82, when it became *Longman's Magazine*) is associated with the names of Carlyle and Thackeray. Others of note are the *British Magazine* (1832-49), the *Dublin University Magazine* (1833-), *Tait's Edinburgh Magazine* (1832-61), *Bentley's Miscellany* (1837-68), *Notes and Queries* (1849-), *Macmillan's Magazine* (1859-), the *Cornhill Magazine* (1860-), *St. James's Magazine* (1861-), the *English Illustrated Magazine* (1883-), *Cassell's Magazine* (1877-), *Temple Bar* (1860-1906), *Review of Reviews* (1890-), the *Strand Magazine* (1891), the *Pall Mall Magazine* (1893-), the *Studio* (1893-), the *Connoisseur* (1901-), and the *Burlington* (1903-). These are only a selection from a long list.

United States. In speaking heretofore of periodicals only typical publications have been cited, and henceforth—and this is especially true of the period from the middle of the nineteenth century to the present—the same method must be followed. Even with this limitation of the field a choice of representative examples is embarrassing and likely to be criticized as arbitrary, especially as no attempt will be made to consider technical publications or publications of a very special or, so to speak, professional appeal, despite the fact that a number of such frequently find their way, directly or by citations, into the hands of the general public. The history of the periodical in the United States be-

gins in Colonial times with the *American Magazine*, issued at Philadelphia, Feb. 13, 1741, by the printer Andrew Bradford, a business rival of Franklin's, and edited by John Webbe. The idea was due to Franklin, who had planned an imitation of the *Gentleman's Magazine* and had incautiously divulged his scheme to Webbe. Franklin's own periodical, the *General Magazine*, was issued on Feb. 16, 1741, its projector thus losing by three days the honor of having edited and published the first monthly in America. Both publications were short-lived, Webbe's perishing with its second number and Franklin's with its sixth. Throughout the entire subsequent development of periodical literature in this country the magazine has taken the first place, reviews having been comparatively few in number and, in general, decidedly inferior in quality. The magazines published down to the Revolution number 16. Among them were the *American Magazine and Historical Chronicle* (Boston, 1743-46), the *Boston Weekly Magazine* (1743-), the *Christian History* (Boston, 1743-44), the *Independent Reflector* (New York, 1752-53), the *New England Magazine of Knowledge and Pleasure* (Boston, 1758-60), the *American Magazine and Monthly Chronicle* (Philadelphia, 1757-58), the *New American Magazine* (Woodbridge, N. J., 1758-60), the *American Magazine* (Philadelphia, 1769), the *Royal American Magazine* (Boston, 1774-75), and the *Pennsylvania Magazine, or American Monthly Museum* (1775-76). Between the close of the war and the end of the century about 40 others appeared, among them the *Columbian Magazine, or Monthly Miscellany* (Philadelphia, 1786-92; from March, 1790, entitled the *Universal Asylum and Columbian Magazine*); the *American Museum, or Repository* (1787-92), of considerable value as a source of historical information; the *Massachusetts Magazine* (Boston, 1789-96); the *New York Magazine* (1790-97), the *Political Censor, or Monthly Review* (Philadelphia, 1796-97), edited by William Cobbett, the *Farmer's Weekly Museum* (Walpole, N. H., 1790-99). The last was edited from 1795 by Joseph Dennie, the founder, in 1801, of the *Portfolio*. Charles Brockden Brown established in 1799, in New York, the *Monthly Magazine and American Review*, which, with a change of name to the *American Review and Literary Journal*, survived until 1802. He later edited the *Literary Magazine and American Register* (Philadelphia, 1803-08).

At the end of the first decade of the nineteenth century the periodicals published in the United States amounted to nearly 30 in number. Only two of them, however, were in any way notable: the *Portfolio* (Philadelphia), above mentioned, which survived until 1827—up to that time a phenomenally long life for an American magazine; and the *Anthology and Boston Review* (Boston, 1803-11), which included Ticknor, John Quincy Adams, and Everett among its contributors. From this time on the number of literary periodicals, to say nothing of religious and other special publications, increased rapidly, with a corresponding improvement in quality. The following are perhaps the most noteworthy: the *Analectic Magazine* (Philadelphia, 1813-20), founded by Moses Thomas, with Irving (its editor, 1813-14), Paulding, and Wilson the ornithologist among its contributors; the *Atlantic Magazine* (New York, 1824-25; continued until 1827 as the

New York Monthly Review), which was edited by Robert C. Sands and had the support of Bryant; the *New York Mirror* (1823-42), of which N. P. Willis was one of the editors; the *Illinois Monthly Magazine* (Vandalia, 1830-32), the first publication of the kind in the West; the *American Monthly Magazine* (New York, 1833-38), edited 1837-38 by Park Benjamin; *Graham's Magazine* (1840-50), a widely and deservedly popular periodical; the *Dial* (Boston, 1840-44), the organ of the New England Transcendentalists, edited by Ripley and Margaret Fuller and then by Emerson; the *International Magazine* (New York, 1850-52), edited by R. W. Griswold, the *Knickerbocker Magazine* (New York, 1833-60), founded by the novelist Charles Fenno Hoffman and edited for some time by Louis Gaylord Clark; *Putnam's Monthly Magazine* (New York, 1853-57, 1867-69; revived in 1906, when it absorbed the *Critic*, only to be itself absorbed by the *Atlantic Monthly* some two or three years later; the *Atlantic Monthly* (Boston, 1857-), perhaps the foremost of American periodicals from a literary point of view, having had as editors Lowell, Fields, Howells, Aldrich, Scudder, Page, Perry, and Sedgwick, and among its contributors Holmes, Longfellow, Whittier, and most of the notable American men of letters; *Harper's Magazine* (New York, 1850), an illustrated monthly; *Scribner's Monthly* (New York), an illustrated monthly founded in 1870 by Dr. J. G. Holland (as editor), Roswell Smith, and Charles Scribner, and from 1881 published, with R. W. Gilder as its first editor, as the *Century Magazine*; the *Galaxy*, incorporated with the *Atlantic Monthly* in 1878 (New York, 1866-), *Lippincott's Magazine* (Philadelphia, 1868-1914; New York, 1914, but with name changed to *McBride's Magazine* in 1915); *Scribner's Magazine*, illustrated (New York, 1887-); the *New England Magazine*, illustrated (1889-); the *Cosmopolitan*, illustrated (New York, 1886-), and *Hearst's Magazine* (New York, 1901), both with immense popular circulations; the *Review of Reviews*, illustrated (1890-); *McClure's Magazine*, illustrated (New York, 1893-), the *Bookman*, illustrated (1895-); *American Magazine*, illustrated (1906-); the *World's Work*, illustrated (1902-). In the periodicals, beginning with the *Atlantic*, the popular literary magazine has reached its highest point of development. Especially important has been the impetus given to developing the art of illustration, and the support given to the obsolescent art of wood engraving by the *Century* and *Harper's*.

The character of the American magazine was vitally changed, first by the new development of the *North American Review* on its purchase by Allen Thorndike Rice in 1877, when it had 1700 circulation. He changed it from a quarterly into a monthly, broke away from its literary traditions, and filled it with articles selected for their timely interest and in part for the popularity or notoriety of those who wrote them. Two results followed. Circulation greatly increased, but it was based on news-stand sales and not on subscriptions. Advertising was stimulated, but its rate came to rest on the size of circulation rather than on its quality. Under these twin influences a magazine to be successful was forced to make each number measurably popular in order to attract circulation, and the magazine which failed to secure this could not get advertising and found its profits diminish-

ing and in many instances disappearing. This tendency was quickened by the appearance of the 10-cent magazine towards the close of the nineteenth century—*Munsey's Magazine* (1889—) being the pioneer, and a very successful one, in this field. During the decade of 1905–15 these changes evolved the characteristic latter-day American magazine—a publication devoted to fiction, profusely illustrated, and reaching an unprecedented circulation of 500,000 to 1,400,000. Prosperous as such magazines were, the fluctuations in their circulation and advertising were great, and a new school of fiction, highly paid, developed by them, greatly increased the income of the successful writer without adding to literature. The literary magazine came to have a relatively small circulation and to reach an audience small as compared to the great population of readers.

C. H. K. Curtis (q.v.), by starting the *Ladies' Home Journal* (Philadelphia, 1883), created a new audience by a magazine with a large folio page, covering all phases of domestic life, occupying itself with domestic morals, and opening a new chapter in the history of advertising by printing reading matter and advertisements on the same page. A circulation before unknown, running above 2,000,000 and maintained for years, led to a host of imitators, some of which approached these figures. The changes noted have had a profound influence on daily newspapers by diverting from them advertising they once had. Magazine contributors have been sharply divided between the small class contributing to the literary magazines and producing works of some literary quality, and a far larger number contributing more ephemeral matter to monthlies and weeklies of phenomenal circulation.

Of American reviews less need be said. Although some of these are excellent, they do not, as a whole, compare favorably with those that have been published in England and on the Continent. Their history begins with the *American Review of History and Politics* (Philadelphia, 1811–13), a quarterly founded by Robert Walsh. This was soon followed by the *North American Review* (Boston, 1815, and subsequently in New York), of which something has just been said in connection with the development of American magazines, and which has continued until the present day. Among its editors have been many eminent men—A. P. Peabody, H. Adams, Dana, Edward Everett, Sparks, Bowen, Lowell, Norton, and George Harvey (consult the centennial numbers of 1915). Among later publications of the kind, overlooking those that were merely ephemeral, are the *Southern Quarterly Review*, first published 1828–32 (Charleston, revived, 1842–55); the *United States Magazine and Democratic Review* (New York, 1837–52, later the *United States Review*, 1853–55); the *New Englander* (New Haven, 1843–92); the *International Review* (New York, 1874–83); the *Forum* (1886–); the *Arena* (1890–1909; in 1910 merged with *Christian Work*); the *Yale Review* (1892–). Of American periodicals appearing oftener than once a month are several which divide their space among various departments—affairs, the arts, literature. Some of these are mentioned in the article *NEWSPAPER*, but several should be noted here as well—the *Nation* (weekly, New York, from 1865; consult the semicentennial number, July 8, 1915); the *Chicago Dial* (fortnightly, 1881–); and the *New*

Republic (New York, 1914–). For statistics of periodicals published in the United States, see table under *NEWSPAPER*.

Modern French Periodicals. In France the periodicals originating in the eighteenth century begin with *Mémoires pour servir à l'histoire des sciences et des arts* (1701–67), founded by the Jesuits Michel le Tellier and Philippe Lalleman at Trévoux (whence it is known as the *Journal de Trévoux*); it gained a high and well-deserved reputation as a critical authority. In 1703 Jean Leclerc began, in continuation of his *Bibliothèque Universelle et Historique* (see above), a review entitled *Bibliothèque Choisie*, which was issued until 1713 and was followed by his *Bibliothèque Ancienne et Moderne* (1714–27). These, as well as various other periodicals edited by Frenchmen in this period, were printed in Holland. Among them are to be noted reviews of particular foreign literatures, as the *Bibliothèque Anglaise* (1717), and the *Mémoires littéraires de la Grande Bretagne* (1720–24) of Michel de la Roche (see above), and the *Bibliothèque Germanique* (1720–40) of Jacques Lenfant. About this time the English periodical essay found imitators in France; Marivaux published in 1722 the *Spectateur Français*, which was followed by a number of other publications of a similar character. Other literary journals were the *Mémoires secrets de la république des lettres* (1744–48), the *Observations sur les écrits modernes* (1735–43) of Desfontaines; the *Lettres sur quelques écrits de ce temps* (1749–54) and *L'Année Littéraire* (1754–90) of Fréron, and the *Observations sur la littérature moderne* (1749–52) and *L'Observateur Littéraire* (1758–61) of the Abbé de la Porte. In 1754 a review, the *Journal Etranger*, designed to deal with foreign literature in general, was founded by Fréron, Grimm, Prévost, and others; it ceased to appear in 1762. This was followed by the *Gazette Littéraire* (1764–66), in the editing of which Voltaire and Diderot had a hand. The *Mémoires secrets pour servir à l'histoire de la république des lettres* (1762–87), also called *Mémoires de Bachaumont*, from its founder, are an important record of contemporary social and literary conditions, the same is true of the *Correspondance Littéraire Secrète* (1774–93). Of a more general character were the magazines *Décade Philosophique*, later the *Revue Philosophique* (1796–1807), of P. L. Ginguené, the most important French periodical of its time, and the *Magasin Encyclopédique*, founded in 1792 and continued from 1817 as the *Annales Encyclopédiques* and the *Revue Encyclopédique*, until 1832. During the second half of this century appeared a number of periodicals dealing with special subjects, such as agriculture, commerce, political economy, military and naval affairs, and so on. In the early part of the nineteenth century, under both the Empire and the Restoration, the periodical as well as the newspaper press was hampered by many restrictions, and but little progress was made. The *Revue Britannique* (1825–1901) was a serial publication, begun in this period, which lived on into the twentieth century. In 1828 Guizot, Rémusat, and others started the *Revue Française*, in imitation of the English reviews; it lived, however, only two years. In 1829 appeared the *Revue de Paris*, which was issued until 1846. The same year (1829) saw the founding of the *Revue des Deux Mondes*, by Ségur-Dupeyron and Mauroy; during 1830 it was not published, but

in 1831 it reappeared and ever since has maintained the high reputation which it at once attained. Pierre Leroux and George Sand started the *Revue Indépendante* in 1841; it ceased to appear in 1848. Among the later literary periodicals are the *Nouvelle Revue* (1879-); *Le Livre* (1880-); the *Revue de Paris* (1894-), which appears fortnightly; the *Grande Revue*; the *Revue Bleu*; the *Revue Latine* (1902-); and the *Revue Germanique* (1905-). In the second half of the nineteenth century periodicals in France increased astonishingly in number. In the last decade of that century not less than 1350 were published in Paris alone, while Parisian periodical publications in the first decade of the twentieth century numbered some 3500.

Modern German Periodicals. In Germany, since the beginning of the eighteenth century, development has been mainly in the direction of the learned and, especially in recent times, of the scientific periodical. An extraordinary number of these have been published, many of them of great value. Literature, however, has also been well represented. Only a few of these journals can be mentioned. One of the earliest and most important was the *Neue Zeitungen von gelehrten Sachen*, founded by J. G. Krause in 1715 and carried on until 1797. It was the first attempt to apply the form of the weekly political journal to learned subjects. Still more notable is the *Göttingische gelehrte Anzeigen*, founded in 1739 as the *Zeitungen von gelehrten Sachen*, and conducted from that time until the present day by members of the faculty of the University of Göttingen, among whom have been Haller, Heyne, and Eichhorn. In 1766 the publisher Nicolai founded the *Allgemeine deutsche Bibliothek*, which was issued until 1806. Lessing and Mendelssohn aided in conducting the *Briefe die neueste Litteratur betreffend* (1759-65), also founded by Nicolai. Wieland founded *Der deutsche Merkur* (1773-89; revived, 1790-1810). The *Allgemeine Litteraturzeitung*, established by Bertuch in 1785 and issued until 1848, was one of the most important of German literary periodicals; the same may be said of the *Jenaische allgemeine Litteraturzeitung* (1804-48), founded by Eichstädt. The *Wiener Jahrbücher der Litteratur* (1818-48) enjoyed a high reputation, as did, for its learning, *Hermes* (1819-31), founded by W. T. Krug. The *Jahrbücher für wissenschaftliche Kritik* (1827-46), published by Cotta, and the *Heidelberger Jahrbücher der Litteratur* (1808-72) should also be mentioned. Of more recent date are the *Deutsche Vierteljahrsschrift* (1838-70); *Illustrierte Zeitung* (1843-); *Literarisches Zentralblatt* (1850-); *Westermanns illustrierte deutsche Monatshefte* (1850-); *Unsere Zeit* (1857-91); *Preussische Jahrbücher* (1858-); *Ueber Land und Meer* (1858-); *Die Gegenwart* (1872-); *Die Neue Zeit* (1872-); *Die Litteraturzeitung* (1874-); *Deutsche Rundschau* (1874-); *Nord und Süd* (1878-); *Velhagen und Klasing's Monatshefte* (1886-); *Die Nation* (1888-); *Zukunft* (1892-); *Berliner Illustrierte Zeitung* (1892-); *Das literarische Echo* (1899-); *Die Woche* (1899-), said to have had a circulation reaching 500,000; *Deutscher Monatsschrift* (1902-07); *Arena* (1906-); *Morgen* (1907-); *Unsere Zeit* (1907-); *Zenien* (1908-); *Das Neue Jahrhundert* (1909-); *Die Tat* (1909-).

Periodicals in Other Countries. The development in other European countries has been

similar, though less extensive. Italy, in which, as was stated above, the history of periodical literature dates back to the seventeenth century, exhibits a long list of notable literary journals. Among them are the *Frusta Letteraria* (1763-65) of Giuseppe Baretti; the *Novelle Letterarie* (1740-70) of Giovanni Lami; the *Biblioteca Italiana* (Milan, 1816-40); the *Progresso delle Scienze* (Naples, 1832-45); the *Rivista Contemporanea* (Turin, 1853-); the *Giornale degli Eruditi* (1883-); the *Rivista Internazionale* (1869-83); the *Giornale Storico della Letteratura Italiana* (1883-). Spain and Portugal, Belgium, Holland, the Scandinavian countries, Russia, Greece, and the Slavic countries, are all represented by literary periodicals of prominence.

In all the countries mentioned above, periodicals dealing with theology or the interests and practical work of the various religious denominations, with science, either in general or in one or more of its special branches, with the arts or trades, or with other special themes (including periodicals of humor), multiplied greatly during the nineteenth century. Their history cannot be given here even in the briefest summary.

Bibliography. British: Athanase Cuheval-Clarigny, *Histoire de la presse en Angleterre et dans les Etats-Unis* (Paris, 1857); Alexander Andrews, *History of British Journalism* (2 vols., London, 1859); R. R. Madden, *History of Irish Periodical Literature* (2 vols., ib., 1867); James Grant, *The Newspaper Press* (3 vols., ib., 1871-72); H. R. F. Bourne, *English Newspapers* (ib., 1887); J. B. Williams, *History of English Journalism to the Foundation of the Gazette* (ib., 1908); Hugh Walker, "Early Magazines of the Nineteenth Century," in *The English Essay and Essayists* (New York, 1915). Indexes to certain of the more important British periodicals are to be found in Poole's *Index*, the *Cumulative Index*, and the *Reader's Guide*—for all three of which see below. Lists of indexes are in *Lists of Books Forming the Reference Library* (British Museum) (London, 4th ed., 2 vols., 1910). For lists of current British periodicals, see Mitchell's *Newspaper Press Directory* and Street's *Newspaper Directory*.

United States: *Tenth Report of United States Census* (Washington, 1884), the statistics re periodicals; Athanase Cuheval-Clarigny, *Histoire de la presse*, etc. (above mentioned); Frederic Hudson, *Journalism in the United States* (New York, 1873); I. Thomas, *History of Printing in America* (Albany, 1874); H. M. Alden, *Magazine Writing and the New Literature* (New York, 1908). W. F. Poole, *Index to Periodical Literature* (1802-82) (rev. ed., Boston, 1891), containing an index to certain of the more important American and English magazines, which is continued through 1907 in a series of five-year supplements and is issued in an abridged edition, *Poole's Index* (Boston, 1901, with later supplements); *Cumulative Index . . . to Periodicals* (Cleveland, 1896 et seq.); *Reader's Guide to Periodical Literature* (Minneapolis, 1901-12; White Plains, N. Y., 1913 et seq.); F. W. Faxon, *Check List of American and English Periodicals* (Boston, 1908); Ayer and Son, *American Newspaper Directory* (Philadelphia, annually), which contains a list of current American periodicals and newspapers, with circulation of each and other data.

French: Eugène Hatin, *Histoire de la presse en France* (8 vols., Paris, 1859-61), *Les gazettes*

de Hollande et la presse clandestine aux 17^e et 18^e siècles (ib., 1865), and *Bibliographie de la presse périodique française* (ib., 1866); V. Gébé, *Catalogues des journaux* (ib., 1879); Brunet, *Manuel du libraire* (8 vols., ib., 1860-80). Some 350 periodicals are indexed in D. Jordell, *Répertoire bibliographique* (Paris, 3 vols., 1899-1900). See also *Annuaire de la presse française* (ib., 1909-10); *Annuaire des journaux, revues, etc.* (ib., 1910); and, for lists of indexes, Stein, *Manuel de bibliographie générale* (ib., 1897).

Germany: Access to periodical German literature is facilitated by the annual *résumés* of the various departments of science, art, and literature—the *Jahresberichte* and *Bibliographien*—which themselves might be regarded as a special kind of periodical. Examples of these are: *Jahresbericht über die Fortschritte der Chemie* (Giessen, 1847); *Bibliographie der Socialwissenschaften* (Dresden, 1905); *Bibliographia zoologica* (Leipzig, 1896); *Bibliographie für Volkswirtschaftslehre, etc.* (1906).

PERIODIC FUNCTION. See FUNCTION

PERIODICITY, IN VEGETATION. Periodicity refers to such phenomena as the flowering of plants at a particular season of the year, the alternation of foliated and leafless condition of forest trees, and any other regularly recurring phases of increased and decreased activity. In temperate and dry regions such alternations of growth activities are very prominent, the season of high temperature and greater rainfall being the period of greater vegetative activity. In tropical lands, with a uniformly warm and moist climate, periodicity is much less evident, and considerable discussion has taken place as to whether such periodic phenomena as leaf fall are due to habits possessed by the plants which persist regardless of environment or whether they are a response to external conditions. There is considerable evidence favoring both views. Many tropical trees grow, flower, and fruit continuously, others grow continually, but flower only in one season of the year; while still others, although evergreen, show periodicity in both their growth and reproductive activities. Some trees are deciduous in temperate regions but evergreen in more tropical lands; others persist in shedding their foliage even when climatic conditions are uniform, thus, the European oak (*Quercus robur*) and the sweet gum (*Liquidambar styraciflua*) both become evergreen in the rain forest of Jamaica, but the tulip tree (*Liriodendron tulipifera*) and the bald cypress (*Taxodium distichum*) retain their deciduous habits even under such uniformly warm and moist conditions. See DECIDUOUS PLANTS; DURATION, FOREST; LEAF

The physiological aspects of periodicity have begun to attract attention, involving as they do important facts affecting plant breeding. It might be supposed that in the temperate zone this is entirely a matter of the presence of growth conditions in the summer and their absence in the winter, but a further study shows the situation to be more complex than this. *Stellaria media* and *Senecio vulgaris* have passed through their entire life history, from seed to seed, ending with death, in a few months. Since these seeds are capable of immediate germination, several generations may appear in a single year. Many plants are true annuals, either because they require the whole growing season for one generation or because the seeds require a winter's rest or even longer before

germination. In biennials like the burdock, beet, and cabbage, the first year involves vegetative growth with abundant food storage, largely used in seed production the second year. In perennials several new features of periodicity appear. Bud formation and development of foliage from buds form one. In trees and shrubs of the temperate zone, as foliage begins to develop in the spring, buds are formed in the axils of leaves and at the end of the shoot. These buds ordinarily do not form new shoots until the following spring. They may be forced to immediate development by the removal of all leaves if this is done before July. They may be forced to foliage development from early autumn on by a great variety of stimuli, as anæsthetics, injection of water and water solutions, period of storage at high temperatures (35°-40° C.), and others. The period from July 1 to October 1 is generally marked by deep dormancy. In certain years a warm period in autumn may lead to the second formation of foliage or fruit. Also in some trees this occurs as a rule, while in the rose growth ceases only when conditions are such as to prevent it.

In trees and shrubs of the temperate zone starch formation and hydrolysis also show periodicity. The deposit of starch begins in July and continues until leaf fall. In November and the following months the starch is gradually transformed to soluble sugars in some forms and to fats in others. The period of minimum starch coincides rather closely with the end of dormancy of the buds. In the warm months of the spring starch formation at the expense of soluble sugars and fats again sets in. Starch deposit and hydrolysis are apparently entirely determined by temperature, higher temperatures produce the former and lower temperatures the latter. The question has been much discussed whether periodicity in trees and shrubs of the temperate zone is not directly or indirectly determined by periodicity in climate. In large part this seems to be the case, for when these forms are cultivated in tropical climate they readily or gradually lose the periodicity typical for the normal habitat. On the other hand, periodicity in foliage formation and leaf fall is of rather frequent occurrence, even in the almost constant climate of the wet tropics. In some trees (*Albizia moluccana*, *Artocarpus incisa*, etc.) there is a continual leaf formation and leaf fall. In others periodicity is evident apparently independent of periodicity in external conditions. For instance, in *Herea brasiliensis* of the rainy forests of Pará, 30 days of vigorous foliage formation is repeatedly alternated during the year with 10 days of rest. Klebs believes periodicity is generally the counterpart of climatic rhythm, while Volkens relates it to a necessary rhythm of the protoplasm. Küster argues that it may be independent of both climatic rhythm and rhythm specific of living protoplasm, for rhythmic structures appear in nonliving colloidal media under constant conditions.

Quite generally in plants reproduction and vegetation alternate or hold a sort of antithetical relation to each other. In many algae and fungi, but by no means all, Klebs found methods of throwing the organisms into one phase of development or the other almost at will. In this matter a variety of conditions may lead to the same result. For flowering plants, however, he derived a more general rule. High water and

salt (especially nitrates) supply, with good illumination, favors vegetation and represses reproduction; while shortage in water and salts, with good illumination, favors reproduction and represses vegetation. This is illustrated by potatoes and beans going to vines, apple trees producing vigorous vegetation and little fruit, and cereals giving abundance of straw and little grain in very rich soils well supplied with water. There are other factors of great significance in determining the dominance of reproduction of vegetation. Among these are form-determining materials within the plant and position of the organ on the plant.

Frequently the seeds and spores produced by plants will not germinate immediately, but require a rest or dormant period. In many annuals (wild oats, *Amarantus retroflexus*, etc.) only a few months are needed, which insures that the seeds will not germinate in the fall, but will be carried over to the following spring. In the cocklebur one seed germinates in the spring following ripening, and the second seed a year later, while in many seeds (*Chenopodium album*, various legumes, Malvacæ, and others) a single crop is distributed in its germination over several years. This, along with the great number of seeds produced by weeds, insures that the soil will always be well supplied with seeds in process of germination. This is one character of weeds that makes them so difficult of eradication. Dormancy, especially prolonged dormancy, is far more common in the seeds of wild plants than of those long under cultivation. Yet this character often renders commercial seeds (clover, alfalfa, etc.) ripened under certain conditions almost worthless for crop production. It is known that some seeds lie in the ground in the dormant condition, still capable of producing plants, for as long as 50 years. Delay in moist soil (if we except those requiring light for germination) is due in general to one of two characters: (1) character of the colloidal structures surrounding the embryo; or (2) character of the embryo. The structures surrounding the embryo may stop germination by preventing water absorption (many legumes, Malvacæ, Chenopodiaceæ, etc.), by limiting water absorption through mechanically restricting the enlargement of the embryo (*Alisma* and many other water plants), or by reducing oxygen supply below the minimum necessary for germination (cocklebur and many other Compositæ, *Datura*, *Chloris ciliata*, wild oats, and others). In some seeds (thorns, haws, apples, and other Rosacæ, as well as members of other families) the naked embryo can grow only after it has gone through certain changes due to a longer or shorter period of exposure in dry or in germinative conditions. In some (*Eranthis hyemalis*, *Ranunculus ficaria*, and others) this period is required for the maturing of the embryo, which is very rudimentary in the newly ripened seed. No doubt both coat and embryo characters often act together to secure delay. Consult texts cited under PHYSIOLOGY OF PLANTS; and for the ecological aspects of periodicity, consult: Georg Klebs, *Ueber die Rythmik in der Entwicklung der Pflanzen* (Heidelberg, 1911); G. Volkens, *Laubfall und Lauberneuerung in den Tropen* (Berlin, 1912); Forrest Shreve, *A Montane Rain-Forest: A Con-*

tribution to the Physiological Plant Geography of Jamaica (Washington, 1914).

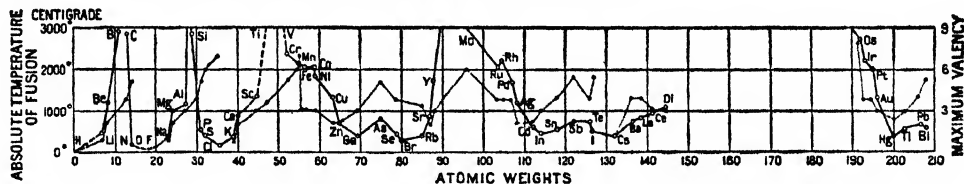
PERIODIC LAW. The generally accepted embodiment of the relations existing between the properties of the several chemical elements. It may be stated as follows: If the elements are arranged in the order of their atomic weights, each of their properties varies as a periodic function of the atomic weights.

Ever since the work of Richter, Proust, and Dalton had established the idea of fixed numerical values attaching to the ingredients of compounds, an idea which was deduced by Dalton from the hypothetical existence of individual atoms identical in size, mass, and other properties for any one element, chemists sought to deduce a closer relationship between the various elements from a comparison of the masses of their respective atoms. (See ATOMIC WEIGHTS; CHEMISTRY) The first attempt was that made by Dr. Proust in 1815 to prove that all the atomic weights were even multiples of the atomic weight of hydrogen, and that the latter was the only primitive element, from which the others were derived by processes of condensation. It was soon found that very few elements possessed atomic weights that could be expressed by integers when the atomic weight of hydrogen was set at unity, and Proust's law was gradually modified to state that one-half the atomic weight of hydrogen, then that one-quarter, should be taken as the real standard. Refinements of investigation have since established the relative atomic weights to the second place of decimals, and it can now be asserted that while the number of exact coincidences with Proust's law, as compared with that of deviations from it, is greater than what would be expected by the theory of chances, it is far from justifying the recognition of Proust's law as anything like a general rule. Proust's law has, therefore, been practically abandoned. On the other hand, interesting relations were found to exist between the atomic weights of similar elements. Thus, Doebereiner established, in 1829, his so-called triads, sets of three closely related elements whose atomic weights were approximately in arithmetical progression, as lithium (7), sodium (23), and potassium (39); calcium (40), strontium (88), and barium (136); sulphur (32), selenium (79), and tellurium (127); chlorine (35.5), bromine (80), and iodine (127); iron (56), nickel (57), and cobalt (58). These triads were later extended to include longer sets, and it was also pointed out that the constant differences were in many cases multiples of 16, the atomic weight of oxygen, whence it was assumed that the heavier elements of a group might be oxides of the lightest, thus reducing the number of primordial elements considerably. The idea of connecting all the atomic weights in a single progression wherein similar elements recurred at regular intervals seems to have first occurred to De Chaucourtois, and shortly afterward Newlands; but the law in its complete form is due to Mendeléev and Lothar Meyer, who reached the same conclusion independently in 1869. As Mendeléev's exposition was by far the more convincing, he has been given the greater share of the credit.

A good idea of the fundamental principle can be obtained from the accompanying figure, in which the maximum valencies of the elements and their melting points are shown to be periodically related to the atomic weights. The latter are

laid off as abscissas, and the valencies and melting points as ordinates, on arbitrary scales. It will be seen that the two curves connecting the respective points are undulatory, with well-defined maxima and minima, which occur at regular intervals. The curves for most of the other properties which are capable of precise measurement are found to have a similar character; the maxima and minima, of course, do not always coincide with the same elements in one curve as in another, but the elements which

by Rydberg, who substitutes for the atomic weights a series of closely related numbers, which he calls the ordinal numbers of the elements. In this manner Rydberg succeeds in imparting to the periodic law a more nearly quantitative form and eliminates the apparent exceptions. Unfortunately, Rydberg is unable to ascribe to his ordinal numbers any rational significance, and until this is done his system will hardly supersede the older form of the periodic law.



occupy similar positions on one curve are also found to be similarly located on another. It is especially noticeable, moreover, that such curves indicate a relationship between the groups of elements, as well as between the elements themselves of each single group. Thus, the properties of the alkaline-earth metals are always found to be intermediate between those of the alkalis and those of the aluminium group. Breaks in the continuity of the curves indicate lack of sufficient experimental data.

The arrangement of the elements as shown in the table given on page 350 is the one generally adopted at present, and includes all the well-known elements. An asterisk marks the elements discovered since 1869. Hydrogen occupies a unique position and is generally omitted from the classification. Argon, helium, neon, krypton, and xenon were added by Ramsay as a distinct group of zero valency. The vertical columns include the elements most closely associated with one another and are known as Groups 0, I, II, etc., horizontally we have the Series 1, 2, 3, etc., in which the similarities are not great, excepting that a parallelism exists between the elements of one series as compared with those of another. The elements in odd-numbered series bear a closer resemblance to one another than they do to the elements of the intervening even-numbered series and vice versa, so that it has been found expedient to make two divisions of each group, as will be seen in the table, the odd-numbered series being set to one side, the even-numbered to the other. In the eighth group occur triplets of closely analogous elements to be discussed below. Arrangements into 15 or more individual groups, in place of the twin and triple groups here shown, have been suggested, but not generally adopted. Mention should also be made of the fact that this table can be constructed by writing the elements in the order of their atomic weights along a screw line of slight pitch upon the surface of a cylinder and then, as it were, unrolling the cylinder. Noteworthy modifications of the periodic table of the elements were proposed by Staigmüller in 1902 and by Werner in 1905. Various efforts have been made to connect all the atomic weights by a graphic equation, which would provide for an arrangement on some other kind of a spiral curve, either on a plane or in space, but they have been only moderately successful. Promising, on the other hand, is a series of interesting rules discovered

Before proceeding with a discussion of the details of the table, it may be well to inquire what significance can be attached to this periodic variability of properties as functions of the atomic weight. The many attempts to connect the atomic masses themselves in arithmetical relations would indicate a widespread opinion that the substances now called elements are really compounds of simpler substances, whose particles have a finite mass and represent individuals of distinct chemical properties, so that the chemical elements in each of the periodic groups might be likened to one of the homologous series of organic compounds (See, e.g., HYDROCARBONS). This view really antedates the periodic law, but fails in large measure to account for the resemblance existing between adjacent members of different groups. Others, especially Sir William Crookes, have held that the atoms are really fortuitous agglomerates of an indifferent primordial element and that atoms of approximately the same mass behave similarly because they vibrate similarly, while atoms of greater mass might vibrate harmoniously with the smaller ones. It is difficult to explain, according to this hypothesis of the genesis of the elements, why their number should be as limited as it is. But some facts are known vaguely pointing to the idea that the atoms of elements within the same periodic group are capable of vibrating at harmonically related rates and that the great majority of chemical and physical properties depend upon atomic vibrations. It may, however, be argued that just as violin strings may be composed of different materials and yet vibrate together according to common laws, so may the elements be composed of as many individual materials and still exhibit a periodic recurrence of properties, if the latter depend upon the harmonic vibrations of the atoms. Until much additional proof has been brought, the periodic law, while furnishing a vague indication, cannot be taken as positive evidence of the qualitative unity of matter.

In the table it will be found that the group of the column under 0 contains the elements of zero valency, the first group contains the univalent elements, the second group those which are divalent, and so on up to the seventh, where the maximum valency is seven. The maximum valency of the elements of the eighth group may be set at eight, but their compounds rarely exhibit so high a valency, and in many other respects this eighth group is rather anomalous

PERIODIC ARRANGEMENT OF THE ELEMENTS ACCORDING TO INCREASING ATOMIC WEIGHTS

Series	Groups. 0	I	II	III	IV	V	VI	VII	VIII
1		Hydrogen 1.008							
2	Helium 3.99	Lithium 6.94	Glaucium 9.1	Boron 11.0	Carbon 12.00	Nitrogen 14.01	Oxygen 16	Fluorine 19.0	
3	Neon 20.2	Sodium 23.00	Magnesium 24.32	Aluminium 27.1	Silicon 28.3	Phosphorus 31.04	Sulphur 32.07	Chlorine 35.46	
4	Argon 39.88	Potassium 39.10	Calcium 40.07	Scandium* 44.1	Titanium 48.1	Vanadium 51.0	Chromium 52.0	Manganese 54.93	Cobalt, 58.97
5		(Copper) 63.57	Zinc 65.37	Gallium* 69.9	Germanium* 72.5	Arsenic 74.96	Selenium 79.2	Bromine 79.92	Iron, 55.84
6	Krypton 82.92	Rubidium 85.45	Strontium 87.63	Yttrium* 89.0	Zirconium 90.6	Columbium 93.5	Molybdenum 96.0		Nickel, 58.68
7		(Silver) 107.88	Cadmium 112.40	Indium 114.5	Tin 119.0	Antimony 120.2	Tellurium 127.5	Iodine 126.92	Ruthenium, 101.7
8	Xenon 130.2	Cesium 132.81	Barium 137.37	Lanthanum 139.0	Cerium 140.25	Praseodymium* 140.6	Neodymium* 144.3		Rhodium, 106.7
9									
10				Erbium 167.7		Tantalum 181.5	Tungsten 184.0		Osmium, 190.9
11		(Gold) 197.2	Mercury 200.6	Thallium 204.0	Lead 207.10	Bismuth 208.0			Iridium, 193.1
12			Radium 226.4		Thorium 232.4	Uranium 238.0			Platinum, 195.3
									Gold, 197.2

and is taken as a transition group between the seventh and the first. Thus, the three elements copper, silver, and gold belong, with respect to many of their properties, especially when uncombined, in the eighth group; but their valency is usually low, and many of their salts are so similar to those of sodium that it is often found expedient to place them in the first group, in the positions occupied in the table by their names inclosed in parentheses. These valencies refer especially to the stable oxides. Stable compounds of hydrogen occur only in the fourth, fifth, sixth, and seventh groups, four atoms of hydrogen combining with one of each element of the fourth group, and this amount decreasing until we find the halogens in the seventh group univalent towards hydrogen. The first group includes the most electropositive elements, and there is a steady transition towards the electronegative end of the series in the seventh group, while the eighth group shows a rather sudden return towards the electropositive side. The majority of the compounds derived from elements at the left end of the table are soluble, colorless, and volatile, whereas these properties change from left to right until we find the maximum of insolubility, color, and resistance to heat in the lower right hand of the table. It is also possible to select analogous compounds of the different elements and find those of similar properties fall within a well-marked zone upon the chart. Mendeléev, in his original essay, added the following: (1) the elements which have the lowest atomic weights are those most widely distributed in nature, and also represent the most typical characteristics found in the second series of the table; (2) the atomic weight determines the character of an element, (3) from a consideration of their position in the system new analogies can be discovered between elements, (4) it may be expected that new elements should be discovered to fill blank spaces within the table, and their properties can be predicted from a consideration of those of the adjacent elements, (5) errors in the assumed atomic weights may be detected through an irregularity in the position of the element in the periodic system.

All of those statements have been verified, and the immediate acceptance of Mendeléev's views was facilitated especially by the sensational discovery of a number of elements whose properties agreed accurately with those predicted by Mendeléev. Thus, gallium, germanium, and scandium (qq.v.) had been completely described with respect to their own properties and those of their compounds before they were actually discovered. Success has also attended the attempts to correct atomic weights in several cases where the elements appeared misplaced in the original tables and were assigned to positions more in accordance with their properties, but necessitating the assignment of new atomic weights (See ATOMIC WEIGHTS.) The weakest point of the table lies in the position of tellurium, which should fall in the sixth

group, but is found to have a higher atomic weight than iodine, which undoubtedly belongs to the same series in the seventh group. Efforts to explain this discrepancy have been so far unavailing. There are also a number of elements derived from the so-called rare earths whose place in the system is not readily assignable. In the latter case, however, it may be said that their properties and atomic weights are not so well established as to cast doubt upon the theory through their failure to coincide with it. One interesting result of the theory is that of limiting the probable number of chemical elements to about 120, since the actual number of blank spaces is limited, and since it is unlikely that any elements remain to be discovered with an atomic weight less than that of hydrogen or greater than that of uranium.

Among the physical properties which appear as periodic functions of the atomic weight may be mentioned the densities of the uncombined elements and of their oxides, fusibility, atomic volume, compressibility, crystalline structure of the compounds, coefficient of expansion, refractive index, conductivity for heat and electricity, color, and velocity as ions.

As an indication of some purely chemical-periodicities the following conspectus has been arranged, in which the elements are indicated by their positions in the above table, and are generally enumerated in such order that the one which shows the property in the most marked degree has precedence. The maximum valency of the elements towards oxygen is indicated throughout by the Roman numeral of each group, omitting the peroxides, in which the oxygen appears to be linked in a different manner.

Maximum valency towards hydrogen in stable volatile compounds:

Univalent: VII; 2, 3, 5, 7, powerfully acid hydrogen compounds.

Divalent: VI; 2, 3, 5, 7; faintly acid hydrogen compounds

Trivalent: V, 2, 3, 5, 7; basic acid hydrogen compounds

Quadrivalent: IV; 2, 3, 5; neutral acid hydrogen compounds

Maximum number of hydroxyls in basic compounds:

One: I; 1, 2, 3, 6, 8. III; 11. VIII; 6 (cd).

Two: II; 2, 4, 6, 8, 3, 5, 7, 11. IV, 11. VIII, 4 (bcd)

Three: III; 3, 4, 5, 6, 7, 8, 10, 12. V; 11. VII; 4. VIII; 4a

Minimum valency in oxygen acids:

One: VII; 3, 5, 7.

Three: V; 2, 3, 5, 7. VI; 3, 5, 7.

Four: IV; 2, 4, 3, 5, 7, 11

Five: V; 4, 6, 10.

Six: VI; 4, 6, 10. VII; 4. VIII; 4a

Tendency to liberate hydrogen from water below red heat:

I; 2, 3, 4, 6, 8. II, 2, 3, 4, 6, 8. VIII; 4a.

Tendency to liberate oxygen from water:

VII; 2, 3, 5.

Elements whose chlorides are unstable towards water:

V; 3, 5, 7, 11, 4, 6, 10, 12. VI; 10, 6, 4

Elements whose sulphides can be precipitated from dilute acid solution:

VIII; 4d, 6 (abcd), 10 (abcd). II; 11, 7.

III; 11, 7. IV; 11, 7, 5. V; 11, 7, 5.

VI; 12, 10, 6

Ability to form alums with the sulphates of I; 2, 4, 6, 8:

III; 2, 4, 6, 10. VI; 4. VII; 4. VIII; 4a.

Ability to form volatile compounds with organic radicles:

With one methyl group: I; 3. VII; 2, 3, 5, 7.

With two methyl groups: II; 3, 5, 7, 11. VI; 2, 3, 5, 7.

With three methyl groups: III; 2, 3, 5, 7, 11. V; 2, 3, 5, 7, 11.

With four methyl groups: IV; 2, 3, 5, 7, 11.

Ability to form complex bases with ammonia:

VIII; 4 (cd), 6 (abcd), 10 (abcd). VI; 4. II, 3, 11.

Bibliography. J. A. R. Newlands, *On the Discovery of the Periodic Law and on Relations among the Atomic Weights* (London, 1884); E. Huth, *Das periodische Gesetz der Atomgewichte und das natürliche System der Elemente* (Frankfurt, 1884); F. P. Venable, *A Bibliography of the Periodic Law* (Easton, Pa., 1896); Albin Belar, *Das periodische Gesetz und das natürliche System der Elemente* (Laibach, 1897); Sir William Ramsay, *Modern Chemistry* (2 vols., New York, 1901); D. I. Mendeleev, *The Principles of Chemistry* (3d Eng. ed., trans. by George Kamensky, ib., 1905); T. W. Richards, *The Compressibilities of the Elements and their Periodic Relations*, published by the Carnegie Institution (Washington, 1907); A. E. Garrett, *The Periodic Law*, in "International Scientific Series," vol xcvi (London, 1909).

PERIÆCI (Lat., from Gk. *Περιαίκοι*, *Periōikoi*, dwellers round, i.e., round about some particular locality or city, from *περιόικειν*, *periōikēin*, to dwell around, from *περί*, *peri*, around + *οικειν*, *oikēin*, to dwell, from *οίκος*, *oikos*, house). The subject population of Laconia and the Spartan territory. They were not slaves like the Helots (q.v.), and seem to have been allowed to govern their own towns, under Spartan oversight; but they could hold none of the higher offices of state, had no share in the general government, and, we are told, could be put to death by the ephors without a trial. They paid a contribution to the kings, but otherwise seem to have been taxed, like the Spartans, only in time of war. As the choicest lands belonged to Spartans, the Periæci seem to have devoted themselves largely to manufacture and trade, which were forbidden to the Spartans. Their work in metal, especially armor, in wool, and in leather, was celebrated and found a ready sale in foreign parts, and their coast towns seem to have enjoyed a flourishing commerce. Their numbers must have been considerable, even though the hundred cities, of which Strabo speaks, were probably most of them of no great size. The Periæci were always more numerous than their superiors, the Spartans, and this disparity increased greatly during the fourth century B.C.; but, though chafing under their inferiority, the Periæci remained loyal till the Theban invasion after the battle of Leuctra (371 B.C.), when many of them joined the victors. They were evidently trusted by the Spartans, for they not only served as light-armed troops, but formed no small part of the heavy-armed forces, while the Spartan fleet must have been almost wholly dependent upon them, and in some cases we find one of their number in command of a squadron or an allied fleet. As the acquisition of the Spartan territory was a gradual conquest, it is not likely that all the

Periœci had the same position. It may also be regarded as certain that while there may have been an Achæan element in some communities, the bulk of the Periœci were Dorian. They are called Lacedæmonians, but not Spartans. Consult the histories of Greece by Grote, Abbott, Busolt, Holm, and Meyer, and Gustave Gilbert, *The Constitutional Antiquities of Sparta and Athens* (Eng. trans., London, 1895).

PERIOSTEUM (Neo-Lat., from Lat. *periostion*, from Gk. *περιόστεος*, *periosteos*, surrounding the bones, from *περί*, *peri*, around + *ὀστέον*, *osteon*, bone). A tough fibrous membrane which surrounds each bone. It is highly vascular and is the means by which the outer layers of the shafts and the greater part of the spongy portions of the bones are supplied with blood. It consists of an outer or fibrous layer and an inner or osteogenetic layer. The inner layer is very vascular and contains many protoplasmic cells called osteoblasts. Numerous experiments show that the formation of bone is essentially due to the action of the periosteum and that, by transplanting detached portions of periosteum into muscular or other tissues, bony tissue is generated in those parts. In most cases in which this membrane has become detached in consequence of a wound or of disease, the exposed bone (except in the instance of the skull, which derives most of its nutrient matter from the dura mater, which is really the periosteum of the inner surface of the skull) perishes, but this is not invariably the case. Among its other offices it serves, by isolating the bone from the surrounding tissues, to prevent the spread of disease from them to it. The shin bone, or tibia, is thus indebted to the periosteum for its ordinary immunity in cases of ulcer in that region. Inflammation of this membrane is of common occurrence and is called periostitis (q.v.).

PERIOSTITIS (Neo-Lat., from *periosteum*). An inflammation of the periosteum (q.v.). It occurs generally on the surface of thinly covered bones, such as the tibia, clavicle, or cranial bones. It may be caused by injury and is part of acute osteomyelitis (q.v.), and, like this disease, it is often brought on in boys and young men by bathing in cold water after violent exercise, or by similar forms of exposure. When the affection is caused by syphilis, oval swellings called nodes (see *NODE*) are produced, and there is considerable nocturnal pain. Rheumatism and tuberculosis are also causes. The acute form of periostitis must be treated with poultices and antiphlogistic remedies, and opiates given to relieve the pain. In severe cases incisions must be made freely in order to relieve pressure and allow of drainage if pus has formed. The treatment of the chronic forms of this affection must be directed mainly to the diseases which originated them.

PERIPATETIC PHILOSOPHY (Lat. *peripateticus*, from Gk. *περιπατητικός*, *peripatêtikos*, given to walking about, from *περιπατεῖν*, *peripatein*, to walk about, from *περί*, *peri*, around + *πάρειν*, *patein*, to walk, from *πάρος*, *patos*, path). A name applied to the philosophy of the school of Aristotle, derived, according to some, from the name of the building in which Aristotle lectured. As a school the Peripatetics had comparatively little interest in metaphysical problems, and spent most of their effort on the study of nature and on an attempt to popularize the study of ethics. Some of them modified to a great extent the teaching of Aristotle,

chiefly in a naturalistic direction. The later members of the school were in general faithful to his teachings, and derived much of their importance from their careful work in the arrangement and explanation of his writings. The two most prominent leaders, after Aristotle's death, were Theophrastus of Lesbos and Eudæmus of Rhodes, who developed his syllogistic methods of reasoning and in the main did little more than supplement his work. Theophrastus was succeeded as head of the school in 288 or 287 B.C. by Strato of Lampsacus, who held the position for 18 years and whose teaching was in the direction of a consistent naturalism. Andronicus of Rhodes, about 70 B.C., did much for the study of Aristotle; and to him is probably due the received arrangement of Aristotle's works, beginning with the *Logic* as a necessary foundation. The Peripatetics of the period following this, while they did much for exegesis, showed a leaning towards Stoicism, and by their eclectic tendency prepared the way for the combination of various systems characteristic of Neoplatonism. Consult: J. S. Reid, edition of the *Academica* of Cicero, p. 19, and references under "Peripatetics" in the index (London, 1885); Theodor Gomperz, *Greek Thinkers*, vol. iv (Eng. trans. by G. G. Berry, New York, 1912); Ritter and Preller, *Historia Philosophiæ Græcæ* (9th ed., Gotha, 1913); Ueberweg-Prächter, *Grundriss der Geschichte der Philosophie* (10th ed., Berlin, 1914).

PERIPATUS (Neo-Lat., from Gk. *περίπατος*, a walking around, from *περιπατεῖν*, *peripatein*, to walk around). This strange creature stands alone, with no animals intermediate between itself and the worms on the one hand and the true Arthropoda on the other. Originally supposed to be a worm, it is now referred to a class by itself, the Malacopoda of Blainville or Protracheata of Haeckel. It lives in the tropics, in damp places under decaying wood. In general appearance it somewhat resembles a caterpillar, but the head is soft and wormlike, though it bears a pair of antenna-like tentacles. It may be said rather to resemble superficially a leech with clawed legs, the skin and its wrinkles being like those of a leech. There is a pair of horny jaws in the mouth, but these are more like the pharyngeal teeth of worms than the jaws of arthropods. The numerous legs end each in a pair of claws. The ladder-like nervous system is unlike that of annelid worms or arthropods, but rather recalls that of certain mollusks, as well as that of certain flatworms



PERIPATUS.

and nemertine worms. Its annelid features are the large number of segmentally arranged true nephridia and the nature of the integument. Its arthropodan features, which appear to take it out of the group of worms, are the presence of tracheæ, of true salivary and slime glands, of a pair of coxal glands, as well as of claws at the end of the legs. The heart is arthropodan, being a dorsal tube lying in a pericardial sinus with many openings. This assemblage of characters is not to be found in any marine or terrestrial worm.

The tracheæ are fine unbranched tubes, without

a spiral thread, and are arranged in tufts, in *Peripatus edwardsii* opening by simple orifices or pores (stigmata) scattered irregularly over the surface of the body, but in another species (*Peripatus capensis*) some of the stigmata are arranged more definitely in longitudinal rows on each side, two dorsally and one ventrally. The stigmata in a longitudinal row are, however, more numerous than the pairs of legs.

The salivary glands, opening by a short common duct into the underside of the mouth, in the same general position as in insects, are evidently, as the embryology of the animal proves, transformed nephridia, and, being of the arthropodan type, explain the origin and morphology of those of insects. It is so with the slime glands, these, with the coxal glands, being transformed and very large dermal glands. Those of insects arose in the same manner and are evidently their homologues, while those of *Peripatus* were probably originally derived from the setiparous glands in the appendages (parapodia) of annelid worms.

The genital glands and ducts are paired, but it is to be observed that the outlets are single and situated at the end of the body. In the male the ejaculatory duct is single; in its base a spermatophore is found. It will be seen, then, that *Peripatus* is not only a composite type and a connecting link between worms and tracheate arthropods, but that it may reasonably be regarded, if not itself the ancestor, as resembling the probable progenitor of chilopods, myriapods, and insects, though of course there is a very wide gap between *Peripatus* and the other antennate, air-breathing Arthropoda.

Consult: H. N. Moseley, "On the Structure and Development of *Peripatus Capensis*," in *Philosophical Transactions of the Royal Society* (London, 1874); A. Sedgwick, "The Development of *Peripatus Capensis*," parts i, ii, iii, in *Quarterly Journal of Microscopical Science* (ib., 1885-87); A. S. Packard, *Text-Book of Entomology* (New York, 1898); for more recent scattered references, consult various volumes of the *Zoological Record* (London).

PERIPLUS (Lat., from Gk. περίπλος, *periploos*, περίπλους, *periploous*, voyage round, from περίπλεϊν, *periplein*, to sail round, from περί, *peri*, around + πλεῖν, *plein*, to sail). A name for various ancient maritime itineraries, as that of Hanno. See the second article HANNO, 1.

PERIPNEUMONIA. See PLEUROPNEUMONIA.

PERIPYTERAL (from Lat. *peripteros*, from Gk. περίπτερος, with a single row of columns around, from περί, *peri*, around + πτερόν, *pteron*, wing, row of columns). An adjective applied to a temple or like building having a colonnade of free-standing columns entirely surrounding the cella. See PERISTYLE; PSEUDOPERIPYTERAL.

PERISCOPE, pēr'ī-skōp (from Gk. περί, *peri*, around + σκοπός, *skopos*, watcher). An apparatus for conducting observations from a concealed or protected position. It consists essentially of reflecting mirrors or prisms at opposite ends of a tube with the reflecting surfaces parallel and at 45° angle with the tube's axis. The field periscope is much used in trenches and behind parapets and earthworks. The submarine periscope is a larger and more elaborate instrument. It consists of reflecting prisms at top and bottom of the vertical periscope tube with several lenses between them and an eyepiece at the

lower end. It is contained in a strong, thick casing tube, 4 to 6 inches in diameter, which is sufficiently rigid to stand the pressure of the water without material flexure. The only part of the outer tube which turns is the head, and this is attached to the inner one. The observer stands at the lower end of the inner tube, which he can turn by means of a lever or a crank and gearing. The field of a periscope of ordinary type is small, but several recent improvements have extended it somewhat. The magnification of distant objects is from 1.5 to 6 diameters. A simple form of periscope was devised more than 200 years ago; the present development dates from 1854, and the more important improvements have been effected in the past 25 years. See TORPEDO BOAT, SUBMARINE.

PERISPERM (from Gk. περί, *peri*, around + σπέρμα, *sperma*, seed). The nutritive tissue in seeds outside of the embryo sac. It represents the tissue of the nucellus which has not been destroyed by the encroachment of the sac, and is chiefly characteristic of certain of the more primitive families of Dicotyledons. The ordinary nutritive tissue of seeds is developed within the embryo sac and is known as endosperm. See SEED.

PERISODACTYLA (Neo-Lat. nom. pl., from MGk. περισσοδάκτυλος, *perissodaktylos*, having an odd number of toes, from Gk. περισσός, *perissos*, beyond the regular number of size, odd + δάκτυλος, *daktylos*, finger, toe). A suborder of the Ungulata, containing all those forms which have an odd number of toes, as distinguished from the even-toed ungulates, Artiodactyla. The third digit is always the largest and sometimes the only functional one. The carpal, metacarpal, tarsal, and metatarsal bones are correspondingly modified. The stomach is simple and nonruminant. In all living forms the horns, if present, are median and not lateral. Many fossil forms are known, but the living species are comparatively few, and are naturally and easily grouped in three families—the tapirs, rhinoceroses, and horses. See UNGULATA.

PERISTALTIC MOTION (from Gk. περισταλτικός, *peristaltikos*, compressive, from περιστέλλειν, *peristellein*, to wrap around, from περί, *peri*, around + στέλλειν, *stellein*, to place, to compress). The terms "peristaltic" and "vermicular" are applied to the peculiar wavelike motion or action of the stomach and intestines by which the food is regularly moved onward. Peristalsis takes place from one end of the intestinal tract to the other, but it is seen at its best in the small intestine. Peristaltic movements are effected by the alternate contraction and dilation of successive portions of the muscular coats. These coats are two in number, an external longitudinal and an internal circular layer of fibres, under the control of the sympathetic nervous system through the agency of the ganglionic plexus situated in the intestinal walls. In peristalsis the longitudinal fibres contract first and draw the intestine backward over the substance to be propelled, shortening and dilating the tube at this point, while the circular fibres of the same part contract in succession from above downward, forcing the substance into the next portion of the intestine, where the same process is repeated.

Under ordinary circumstances peristalsis gives rise to no sensation, the presence of food being just sufficient stimulus for normal action. In the presence of irritating substances, however,

peristalsis becomes painful, violent, and spasmodic. When the intestinal canal is empty there is probably little or no movement. See DIGESTION

PERISTOME (from Gk. *peri*, *peri*, around + *στόμα*, *stoma*, mouth). The fringe of teeth around the mouth of a moss capsule. See MUSCUL.

PERISTYLE (from Lat. *peristylum*, Gk. *περίστυλον*, *peristylon*, a building or room with columns around it). In architecture, a colonnade surrounding a building or a court, or the building or court thus surrounded. One of the characteristic divisions of the Roman house was an open court called the peristyle, similar in shape to the atrium (q.v.), but larger, and surrounded with columns carrying a roof on all sides of the central open space. See August Mau, *Pompeii: Its Life and Art*, translated by F. W. Kelsey (2d ed., New York, 1902).

PERIT, PELATIAH (1785-1864). An American merchant and philanthropist, born in Norwich, Conn., of Huguenot ancestry, and educated at Yale College, where he graduated in 1802. After acting as a clerk in a Philadelphia importing house (1805-09), he went to New York City, where he entered the firm of Goodhue & Co., shipping merchants, in 1817. From 1853 to 1863 he was president of the Chamber of Commerce, and in the latter year retired from business. Perit was prominent in many charities, especially in behalf of seamen, as a member of various boards of the Presbyterian church, and as an officer of the American Bible Society. In 1857, during the war between the New York municipal and metropolitan police, he was police commissioner and did much to restore order. His projected history of American commerce, begun after his retirement from business, was not completed.

PERITHECIUM (Neo-Lat., from Gk. *peri*, *peri*, around + *θήκη*, *thêkê*, box). One of the three types of ascocarp developed by the Ascomycetes (q.v.). It is a flask-shaped structure, lined by a hymenium (q.v.), and is characteristic of the Pyrenomycetes (q.v.) or black fungi, which includes such well-known forms as the black knot and ergot fungus.

PERITONEUM (Lat. *peritoneum*, *peritonæum*, from Gk. *περιτρίβαιον*, *peritonaion*, neut. sing. of *περιτρίβαιος*, *peritonaos*, stretched around, from *περιτείνειν*, *periteinein*, to stretch around, from *peri*, *peri*, around + *τείνειν*, *teinein*, to stretch). A serous membrane which more or less completely invests all the viscera lying in the abdominal and pelvic cavities and is then reflected upon the walls of the abdomen, so that there is a visceral and a parietal layer. Numerous folds are formed by the visceral layer as it passes from one organ to another. They serve to hold the parts in position, and at the same time inclose vessels and nerves. Some of these folds are termed ligaments, from their serving to support the organs. Thus, we have ligaments of the liver, spleen, bladder, and uterus formed by peritoneal folds. Others are termed mesenteries and connect the intestines with the vertebral column. They are the mesentery (q.v.) proper, which has been already described, the ascending, transverse, and descending mesocolon, and the mesorectum. Lastly, there are folds called omenta, which proceed from one viscus to another. They are three in number, viz., the lesser or gastrohepatic omentum, which extends from the undersurface of the liver to the lesser curvature of the stomach;

the gastrosplenic omentum; and the great (or gastrocolic) omentum, which consists of four layers of peritoneum, the two which descend from the stomach and the same two returning upon themselves and ascending as high as the transverse colon, where they separate and inclose that organ. These separate layers may be easily seen in the young subject, but in the adult they are more or less blended. The great omentum always contains some adipose tissue, which in corpulent persons often accumulates to an enormous extent. Its use appears to be (1) to protect the intestines from cold and from injury by covering them anteriorly as with an apron, and (2) to facilitate their movement upon each other during their peristaltic action. In the female the peritoneal cavity is not completely closed, as the Fallopian tubes open into it by their free extremities. Inflammation of the peritoneum is termed peritonitis (q.v.).

PERITONITIS (Neo-Lat., from Lat. *peritoneum*, *peritonæum*, peritoneum). An inflammation of the peritoneum (q.v.). Peritonitis may be acute or chronic, primary or secondary. Primary or idiopathic inflammation of the peritoneum occurs after exposure to cold or wet. Its rarity is rather remarkable, considering how frequently the pleura, pericardium, and similar structures are affected. Secondary peritonitis is due to an extension of inflammation from or perforation of one of the abdominal viscera. By extension it may follow an inflammation of the stomach or intestines or extensive ulcerations of these parts, abscess of any of the solid organs or of the retroperitoneal tissues. Perforative peritonitis commonly arises from penetrating wounds or ulcer of the stomach or bowels. An important cause is perforating appendicitis, which is responsible more often than any other single cause, and especially in young adult males. A more liberal blood supply renders the appendix of the female less liable to damage, but, on the other hand, the generative organs are a frequent means of introducing an infection into the peritoneal cavity.

Acute peritonitis generally presents well-marked symptoms. It commences with a chill, or severe pain in the abdomen may be the first symptom. The pain is at first confined to particular spots (usually in the lower part of the abdomen), but it soon extends over the whole abdominal region. It is increased, on pressure, to such an extent that the patient cannot even bear the weight of the bedclothes; and to avoid, as far as possible, internal pressure upon the peritoneum, he lies perfectly still, on his back, with the legs drawn up, and breathes by means of the ribs, in consequence of the pain occasioned by the descent of the diaphragm in inspiration. The breathing is shallow, and, less air being admitted at each movement of respiration, the number of those movements is increased. There are 40 or even 60 respirations a minute, instead of 18 or 20. The pulse is very frequent, often 120 or more in the minute, and small and tense, though occasionally strong and full at the commencement of the attack. The temperature may rise rapidly after the chill to 104° or 105°, but is subsequently lower. In some very severe cases fever does not occur throughout the attack. Vomiting is an early and prominent symptom and causes great pain. After the disease has continued for a certain time the belly becomes tense and swollen, the enlargement be-

ing caused at first by flatus and afterward also by the effusion of fluid.

The appearance of the patient when at the height of the disease is very characteristic. The "Hippocratic countenance" is more often observed in peritonitis than in any other disease except cholera—"a sharp nose, hollow eyes, collapsed temples; the ears cold, contracted, and their lobes turned out; the skin about the forehead being rough, distended, and parched; the color of the whole face being brown, black, livid, or lead-colored." Acute diffuse peritonitis is usually fatal in from 2 to 10 days. Often death occurs with great suddenness, due to cardiac paralysis.

Chronic peritonitis may result from an attack of the acute form, producing adhesions, either local or general, between the peritoneal surfaces. The intestines may be matted together or compressed at particular points by fibrous bands. Often there are no symptoms, but if the intestine is constricted colicky pains will be felt. Tuberculosis may cause either acute or chronic peritonitis, but usually the latter. It occurs at all ages and presents symptoms of extraordinary complexity and diversity. Sometimes the condition is discovered by accident, during an operation for some other trouble. Caseous masses form, the mesenteric glands are enlarged, and the omentum is irregularly thickened. These masses can be felt through the abdominal walls. Cancerous peritonitis is usually an extension from some other organ.

The treatment of acute peritonitis must be prompt, vigorous, and persistent. In the earliest stage it may be aborted or limited by the use of ice bags locally and a saline or calomel purge. Complete rest is demanded at all stages of the disease. One of the most valuable aids is slow, continuous irrigation of the lower bowel—the "Murphy drip." The intestinal movements may be quieted and pain allayed by the administration of opium, and in the height of the disease this is the only drug worth considering. Tolerance to opium in peritoneal inflammation is great, and comparatively large doses must be given. When due to perforation, as in appendicitis, prompt operation will often prevent the spread of the infection. Tuberculous peritonitis is often cured by simply opening the abdomen, exposing the tuberculous masses to the air, and flushing out the cavity with saline solution. General treatment is unsatisfactory, but fresh air, tonics, cod-liver oil, and creosote may effect a cure.

PERITYPHLITIS (Neo-Lat., from Gk. *peri*, *peri*, around + *typhlos*, *typhlos*, blind, with allusion to the cæcum). An inflammation of the peritoneal covering and the loose connecting tissue attaching the cæcum and ascending colon to the iliac fascia. Formerly what is now known as appendicitis was thought to be due to inflammation of the cæcum, or typhlitis, and of the peritoneum covering it, or perityphlitis; but these conditions are now believed to exist independently of appendicitis only in exceptional cases. See CÆCUM; COLON; VERMIFORM APENDIX.

PERIWINKLE (AS. *pervinca*, *pervince*, *pervenke*, from Lat. *pervinca*, periwinkle, from *per*, through + *vinca*, twist, from *vincire*, to bind), *Vinca*. A genus of plants of the family Apocynaceæ, having a five-cleft calyx and a salver-shaped corolla bearded at the throat, opposite evergreen leaves, and flowers which grow

singly or in pairs from the axils of the leaves. The lesser periwinkle or myrtle (*Vinca minor*), growing in woods and thickets of Europe, is a half-shrubby plant with trailing stems which root at their nodes, ovate-lanceolate leaves, and pale-blue or sometimes white or reddish-purple flowers. The greater periwinkle (*Vinca major*),



GREATER PERIWINKLE.

which has much larger flowers and ovate-cordate ciliated leaves, is a native of the south of Europe. These species are commonly planted in shrubberies and gardens because they rapidly cover unsightly objects with pleasing green foliage and produce beautiful flowers at almost all seasons of the year, even in mild winters. They have escaped in the United States. The former is very commonly found and the latter, which is less hardy, occasionally. The herbaceous periwinkle (*Vinca herbacea*), a Hungarian species, is remarkable for the abundance of its flowers. The rose-colored periwinkle (*Vinca rosea*), a native of Madagascar, is a favorite greenhouse plant.

PERIWINKLE. A small gastropod mollusk of the genus *Littorina*, characterized by the shell being top-shaped, solid, the columella thickened, the lip of the aperture simple, not toothed, and the round aperture closed by a horny operculum. The animal has long tentacles, with an eye at the base of each tentacle. Periwinkles either lay eggs or are ovoviviparous. They abound in vast numbers on the rocky shores of



AMERICAN PERIWINKLES.

1, *Littorina rudis*. 2, *Littorina littorea*. 3, *Littorina palliata*.

the North Atlantic between tide marks and especially near low-water mark. They feed on seaweeds. The two native species are *Littorina rudis*, rather elongated with a high spire, and *Littorina palliata*, which has a low spire with the body whirl rather swollen. The latter varies

greatly in color from pure olive green to yellow or even bright red, with revolving black lines, the colors more or less simulating that of the seaweeds among which it lives.

A much larger species, and now more abundant on the coast north of New York than any other, is *Littorina littorea*, which in 1857 was introduced from Europe into Nova Scotia and now abounds in vast numbers all along the coast. It lives nearer low tide than the native species and frequents exposed rocks not covered by seaweeds. It is a much larger and heavier shell than the others and varies much in the height of the spire. Bumpus has shown that since its introduction into America, where it has been subjected to a new environment, this shell differs from those of England in being more elongated, lighter in weight, more bulky, while the color markings are less pronounced. It also appears that there are already many local races on the New England coast. These mollusks are able to live for days and even weeks out of the sea, in one case four months. The power of resisting dryness seems to be still greater with tropical species. In Jamaica *Littorina muricata* lives among grass and herbage at the top of low cliffs. At Panama three large species were found on trees at and above high-water mark. The eggs of those *Littorinae* which are not ovoviviparous are deposited on seaweeds, rocks, etc., enveloped in a glairy mass just firm enough to retain its shape.

The name "periwinkle" is given popularly to almost any small spiral shell, especially along the shores of the Great Lakes to the turret-shaped pulmonates of the genus *Melania*. In the shortened form, "winkle," it is applied by the oystermen in the neighborhood of New York to the conchs (*Fulgur*) which feed upon the oyster beds. See COCKLE.

PERJURY (Lat. *perjuriū*, false oath, from *perjurus*, one who swears falsely, from *perjurare*, to swear falsely, from *per*, through + *jurare*, to swear, from *jus*, right, law). At common law, the crime of knowingly and willfully giving false testimony which is material to a question in issue in a judicial proceeding. The offense is committed whether the testimony is given under oath or affirmation, provided either is administered by a competent authority. If a witness makes a misstatement through inadvertence or mistake, he is not guilty of the crime; but if he recklessly and knowingly makes a statement as to the truth or falsity of which he has no knowledge, it has been held to constitute perjury. A witness may be convicted of perjury under such circumstances, even though the facts to which he testifies subsequently prove to be true. It is not essential to constitute the offense that the testimony be believed or that it cause a perversion of justice in the cause in which it is given.

In most jurisdictions to-day, as at common law, a voluntary oath taken outside a judicial proceeding cannot be made the basis of a charge of perjury, as the law does not punish criminally prevarication in private matters. An exception to this exists under the laws of the United States. See OATH.

At the early common law the testimony of two witnesses was necessary to convict a witness of perjury. However, to-day in most jurisdictions the testimony of one witness supported by proof of corroborating circumstances is sufficient.

Perjury has always been severely punished, as it tends to the perversion and obstruction of justice. In ancient times in England the penalty was death, subsequently banishment or cutting out the tongue, after the Norman era forfeiture of goods and imprisonment; and at present in England and the United States it is punishable by fine or imprisonment, or both. In a few States a person so convicted is thereby rendered incompetent to give testimony in judicial proceedings.

Subornation of perjury consists in inciting or procuring another to commit perjury. The witness must have actually committed perjury in order to render the person who incited him to do so guilty of the crime. An attorney calling a witness who he believes will not tell the truth does not thereby become liable if the witness does in fact commit perjury, if he did not actually connive at it or solicit him to do so. Subornation of perjury is usually punished with as much severity as perjury itself. Consult the authorities referred to under CRIMINAL LAW and EVIDENCE. See OATH; WITNESS.

PERKASIE, pĕrk'ā-sī. A borough in Bucks Co., Pa., 35 miles north of Philadelphia, on the Philadelphia and Reading and the Lehigh Valley Traction Company railroads (Map: Pennsylvania, L 6). There are silk mills, brickyards, lumber mills, tile works, a stone crusher, and manufactories of cigars, tags and labels, wire novelties, etc. The electric-light plant is owned by the borough. Pop., 1900, 1803; 1910, 2779.

PERKIN, SIR WILLIAM HENRY (1838-1907). An English chemist, born in London. He studied at the Royal College of Chemistry, London, where he was an assistant in Prof. A. W. Hofmann's research laboratory. In 1856 he discovered aniline purple, or mauve, or Perkin's purple, thereby becoming founder of the coal-tar colors (q.v.) industry. He invented also a process of manufacturing madder red, or alizarin, and of making coumarin from the Tonka bean and cinnamic acid from benzaldehyde. Perkin received the Hofmann medal from the Deutsche Chemische Gesellschaft, the Lavoisier medal from the Société Chimique de Paris, and the Davy medal from the Royal Society. He was president of the Chemical Society in 1883-85 and was knighted in 1906. The Perkin Memorial Fund to promote chemical research and a Perkin medal for American chemists were provided for after his death.

PERKIN, WILLIAM HENRY (1860-). An English chemist, son of Sir William Henry Perkin, born at Sudbury, Middlesex. He was educated at the Royal College of Science, and also studied at the universities of Wurzburg and Munich. At the latter school he lectured in 1883-86, was professor of chemistry at Heriot-Watt College, Edinburgh, in 1887-92, and later held the same chair at Victoria University. In 1904 he was awarded the Davy medal by the Royal Society, on whose council he served in 1904-05 and 1908-10. His numerous papers in the *Journal of the Chemical Society* deal largely with alkaloids, camphor, and natural coloring matters. Perkin is author of *Organic Chemistry* (new ed., 1911), with F. S. Kipping.

PERKINS, BENJAMIN DOUGLAS. Son of Elisha Perkins (q.v.) and agent in London for his father's "tractors."

PERKINS, CHARLES CALLAHAN (1822-86). An American art historian, born in Boston. After graduating from Harvard he lived for a time

in Rome, then studied painting in Paris under Ary Scheffer, and on a subsequent visit in 1865 took up etching under Bracquemont and Lalaine. He was one of the founders and honorary director of the Boston Museum of Fine Arts and in 1868 became a corresponding member of the French Institute. He also cultivated music, was president of the Handel and Haydn Society in 1870-83, and occasionally conducted its performances. Through his writings and lectures he contributed much to the promotion of art in this country and enjoyed wide reputation as a critic, but his views have been largely superseded by modern research. He published, *Tuscan Sculptors* (1864) and *Italian Sculptors* (1868), his most important works, both with etchings by the author; *Art in Education* (1870); *Raphael and Michelangelo* (1878), a biographical and critical essay; *Sepulchral Monuments in Italy* (1883); *Ghiberti et son école* (1885). *The Historical Handbook of Italian Sculpture* (1883) is practically a new edition of *Tuscan Sculptors* and *Italian Sculptors*. He was also critical editor of the *Cyclopaedia of Painters and Paintings*, edited by Champlin (1885-87).

PERKINS, ELISHA (1741-99) An American physician, born in Norwich, Conn. He is chiefly known for the invention in 1796 of Perkins's metallic tractors, pins or bars of iron and brass, supposed to possess curative virtues, which were drawn in a certain way over the affected parts in rheumatism, gout, neuralgia, and local inflammations. This method of treatment was called Perkinism, and for a time it enjoyed a certain vogue both in Europe and America. Perkins afterward invented a medicine for fevers, whose efficacy he undertook to prove during the yellow-fever epidemic in New York in 1799, but he himself fell a victim to the disease.

PERKINS, GEORGE CLEMENT (1839-). An American legislator, banker, and shipowner, born at Kennebunkport, Me. At 13 he ran away from home and went to sea as cabin boy, made several trips across the Atlantic, and finally, when 16, shipped before the mast on a vessel sailing to San Francisco around the Horn. On his arrival in 1855 he engaged in mining, then became clerk in a store and eventually its owner. Later he acquired banking, milling, and sheep-raising interests. From 1868 to 1874 he served in the California Senate. Moving to San Francisco from Oroville, he became a member of the firm of Goodall, Perkins, & Co., owners of the Pacific Steamship Company, operating vessels to the Orient and Alaska. A Republican in politics, in 1879 Perkins was elected Governor and had a successful administration. In 1893 he was appointed United States Senator to fill the unexpired term of Senator Leland Stanford. By election he remained in the Senate until his retirement in 1915.

PERKINS, GEORGE WALBRIDGE (1862-). An American financier and political leader, born in Chicago. He received a common-school education and early entered the employment of the New York Life Insurance Company in the Chicago office. There he rose from bookkeeper through various positions to third vice president in 1892, with supervision of the entire agency force, second vice president (1898), chairman of the finance committee (1900), and first vice president (1903). He won a wide reputation for ability in finance. In 1901 he entered the firm of J. P. Morgan as partner and participated in many of the great financial transactions of

that house. He became chairman and director of the International Harvester Company, and director of the International Mercantile Marine Company, the United States Steel Corporation, and many railroad, banking, and insurance companies. The remarkable success of the International Harvester Company was largely attributed to his administration. Perkins was also active in politics, first in the Republican party and later in the Progressive, of whose national executive committee he became chairman. To Roosevelt's campaign for the presidency in 1912 he contributed liberally in funds and in personal service, becoming known as one of the Colonel's most ardent admirers. He endorsed the position of the Progressive party on the trust question and contended that there were some "good corporations" doing big business. In his opinion the Steel Corporation and the Harvester Company were such concerns. In 1915 he pledged himself to lead the effort to prevent Progressives from rejoining the Republicans.

PERKINS, JACOB (1766-1849). An American inventor, born at Newburyport, Mass. While still a boy serving his apprenticeship to a goldsmith, he invented a process of plating shoe buckles. In 1787 the Massachusetts State government engaged him to cut dies for its mint. Later he improved bank-note engraving by substituting steel plates for copper, and in 1800 he invented a machine by which nails could be cut and headed at the same time. When 52 years of age he went to London, where he secured remunerative contracts. He supplied plates to the Bank of Ireland, built steam engines, and completed a number of inventions, among which were a process for transferring engravings from one steel plate to another; the pleometer, an instrument to measure the speed of ships; the bathometer, an instrument to measure the depth of water; and a rapid-firing gun.

PERKINS, JAMES BRECK (1847-1910). An American historian and legislator, born at St Croix, Wis. He graduated at the University of Rochester in 1867, was city attorney of Rochester from 1874 to 1878, became a member of the New York Assembly in 1898, and served as a representative in Congress from 1901 till his death. Recognized as the leading authority in the particular historical field to which he devoted himself, he was honored by membership in the National Institute of Arts and Letters. His writings include: *France under Mazarin* (1887); *France under the Regency* (1892); *France under Louis XV* (1897); *Richelieu* (1900), in the "Heroes of the Nations Series"; *France in the American Revolution* (1911).

PERKINS, JUSTIN (1805-69). An American missionary. He was born at West Springfield, Mass., graduated at Amherst College in 1829, studied theology at Andover, embarked at Boston, 1833, as a missionary of the American Board, and established the Nestorian mission at Urumiah, Persia, in 1834. He was joined by Dr. Asahel Grant (q.v.) in 1835. In 1842 he visited the United States, accompanied by Mar Yohannan, the Nestorian Bishop. Besides a translation of the Bible into modern Syriac (2 vols., 1846-52) and commentaries on Genesis and Daniel (1869), Dr. Perkins published *Eight Years in Persia* (1843); *Missionary Life in Persia* (1861).

PERKINS, THOMAS HANDASYD (1764-1854). An American merchant and philanthropist, born

in Boston. In 1785 he entered into partnership with his brother James in Santo Domingo and was later representative of the firm in the United States. In 1789 he went to Batavia and Canton, to familiarize himself with the Chinese and East Indian trade, and after his return settled in Boston, where he became very successful. He was one of the originators of the Quincy Railroad (the first in the United States), founded the Perkins Asylum for the Blind, contributed liberally towards the erecting of the Bunker Hill Monument, and was one of the chief benefactors of the Boston Athenæum and the Massachusetts General Hospital. Consult T. G. Cary, *Memoirs of Thomas Handasyd Perkins* (Boston, 1856).

PERKIN WARBECK. A pretender to the throne in the reign of Henry VII of England. See WARBECK, PERKIN.

PERKIN WARBECK, THE CHRONICLE HISTORY OF. A tragedy by John Ford (1634), on the career of the pretender of that name. The source was probably Bacon's *Life of Henry VII.*

PERKNITE (from Gk. *περκνός*, *perknos*, dark; connected with Skt. *prāni*, spotted). An igneous rock of granitic texture, composed essentially of augite or hornblende. The term is applied rather to a family of rocks than to an individual species. Perknites are rich in lime and magnesia and low in silica, alumina, and the alkalis. They have generally been included under the family name pyroxenite (q.v.), which has a wider scope of meaning and includes magnesian as well as lime-magnesian rocks.

PERKS, SIR ROBERT WILLIAM (1849-). An English construction engineer, born in Kensington, the son of a prominent Wesleyan minister. He was educated at King's College, London, and from 1878 to 1892 was a railway lawyer. Then, until 1912, he was with Walker & Co., on such construction work as the Manchester Ship Railway, the harbor works and quays at Rio de Janeiro, the Buenos Aires port extension, and the Transandine Railway. He then formed the establishment called Macarthur, Perks, & Co., which built great docks at Havana, and pushed the building of the Georgian Bay Canal. In 1898 he started the Wesleyan Methodist Twentieth Century Million Fund, of which he was treasurer. From 1892 to 1910 he was a Liberal member of Parliament for the Louth Division, Lincolnshire. He was made Baronet in 1908.

PERLES, pēr'lēs, JOSEPH (1835-94). A German rabbi and Orientalist. He was born at Baja in southern Hungary and studied at Breslau, where he took his doctor's degree in 1859, his thesis being *Meletemata Peschiththioniana*. This monograph advanced the theory that the Peshitto version, though preserved only by the Christian Church, is Jewish in tone and influence. In 1862 Perles became rabbi at Posen, whence he went to Munich in 1871. Besides the dissertation already mentioned, Perles published valuable papers on the history of the Jews during the Middle Ages and on Hebrew etymology and philology.

PERLEY, SIR GEORGE HALSEY (1857-). A Canadian statesman. He was born at Lebanon, N. H., and was educated at St. Paul's School (Concord, N. H.) and at Harvard University. Entering business in Canada, he became prominent as a lumber merchant and manufacturer and engaged also in banking and railroad-ing. In 1900 and 1902 he was an unsuccessful

Conservative candidate for the House of Commons, but was elected for Argenteuil in 1904. He was appointed chief whip for the Conservative party in 1911 and actively opposed the Taft-Fielding reciprocity agreement. On the defeat of the Laurier administration in 1911 he became a Minister without portfolio in the administration of Robert Laird Borden (q.v.). After the death of Lord Strathcona and Mount Royal in 1913, Perley was appointed acting High Commissioner for Canada in London. In 1915 he was knighted (K.C.M.G.).

PERLEY, HENRY FULLERTON (1831-97). A Canadian engineer, son of Moses Henry Perley (q.v.). He was born at St. John, New Brunswick, was educated at Fredericton, studied civil engineering, and in 1848-52 made railway surveys for the provincial government. In 1854-56 he was employed in Grand Trunk Railway construction and in 1856-60 was resident engineer for the New Brunswick government in the construction of the St. John and Shediac Railway. After two years as engineer for the Nova Scotia government he went to England in 1865 to take a prominent part in the construction of the Metropolitan Extension Underground Railway in London. In 1870-72 he was again in the New Brunswick government service and in 1872-79 served as Dominion engineer in charge of harbors in the Maritime Provinces. Perley was appointed chief engineer of the Department of Public Works at Ottawa in 1879.

PERLEY, MOSES HENRY (1804-62). A Canadian administrator and scientist, father of Henry Fullerton Perley. He was born at Mau-gerville, New Brunswick, was educated at St. John, and was called to the bar in 1830. He did not practice his profession, but engaged in the milling and lumbering business. His love of exploration and his ability in the natural sciences gradually made him an expert on the physical resources of the various British North American provinces. About 1840 he was appointed Indian Commissioner and Emigration Agent for New Brunswick. In 1848-51 he made valuable reports on the fisheries of New Brunswick, Gulf of St. Lawrence, and the Bay of Fundy. During the negotiations preceding the Reciprocity Treaty of 1854-66 between the United States and Canada (see RECIPROCITY) Perley was foremost in procuring decisive information on the Canadian side, and in 1854-62 he served as Imperial Commissioner to aid in carrying the terms of the treaty into effect. He founded the Natural History Society of New Brunswick and contributed to several English and American literary and scientific journals. Besides his reports on fisheries he published: *Report on the Forest Trees of New Brunswick* (1847); *Catalogue of Fishes of New Brunswick and Nova Scotia* (1851); *Observations on the Geology and Physical Characteristics of Newfoundland* (1862).

PERLITE. See IBON.

PERM, perm. A government of east Russia consisting of 12 districts and bounded by the Government of Volgoda on the north, Tobolsk on the east, Orenburg and Ufa on the south, and Viatka on the west (Map: Russia, J 3). Area, about 127,600 square miles. While politically a government of European Russia, geographically Perm belongs partly to Asia. The centre of the region is occupied by the Ural Mountains (q.v.), which traverse the district from north to south. They hardly exceed 5000 feet in their highest

points. The eastern part of the government is lower than the western. (For geology, see **PERMIAN SYSTEM**.) Perm is watered by the Kama, Petchora, and Sosva, with their tributaries. The largest of these streams are navigable.

The climate is continental and harsh, especially in the mountainous districts of the centre. In regard to its mineral deposits Perm exceeds every other government of European Russia. The chief minerals are gold, silver, iron, copper, platinum, nickel, zinc, coal, and salt. Precious stones, such as sapphires, jacinths, topazes, and many others, are also found in considerable quantities. The mining of iron and copper employs about 200,000 persons. The value of the annual output approximates \$30,000,000. The annual output of gold exceeds \$2,500,000, while the output of coal is still inconsiderable.

Agriculture is carried on all over the district, but only in the black-soil region of the south is production equal to requirements. Stock raising is especially developed among the Bashkirs. Perm has extensive forests, which cover over 80 per cent of the total area. Lumbering and shipbuilding are carried on to some extent. The house industry is favored by the abundance of natural resources. The products of that industry include hardware, pottery, wooden articles, yarns, coarse cloth, ropes, trunks, etc. The manufacturing industries are chiefly in connection with the mineral industries, viz., the manufacturing of steel, iron, etc. The fairs of Irbit (q.v.) are of considerable importance in the trade with the eastern possessions of Russia, but since the construction of the Trans-Siberian Railway the commerce has fallen off to a perceptible extent. Pop., 1913, 3,912,700, including a considerable number of Bashkirs, Permiaks, Tatars, Tcheremisses, and Voguls. The exploitation of the mining resources of the region was begun by the Stroganovs in the sixteenth century. Capital, Perm.

PERM. The capital of the government of the same name in east Russia, on the left bank of the Kama, 300 miles northeast of Kazan (Map: Russia, J 3). It is regularly laid out; the houses are mostly of wood. Its educational institutions comprise two Gymnasias, a Realschule, a museum, a meteorological station, and a number of scientific societies. There are several machine works, tanneries, etc., and the port carries on an extensive transit trade during the navigable season. Pop., 1911, 61,614. The town was founded on the site of a mining settlement in 1781.

PERMANGANIC ACID. See **MANGANIC** AND **PERMANGANIC ACIDS**.

PERMEABILITY. The permeability of various membranes of plants is of great significance in determining the interchanges of materials between these organisms and their environment. The undifferentiated cell walls of plants are very permeable to water and to most solutes dissolved in it. Differentiated walls often behave differently. Dried seed coats are impervious to gases and to liquids like ether and chloroform, while soaked coats allow these substances to pass readily. The coats of some seeds are impervious to water and such seeds can lie in water for years without noticeable swelling. Many seed coats and other plant membranes are highly permeable to water, but prevent the passage of sugar and other organic materials and certain salts dissolved in the water. Such semipermeable

membranes are of great physiological significance in preventing the loss of organic and perhaps often inorganic materials from plant organs in contact with wet soil or water. See **ABSORPTION**; **OSMOSIS**.

PERMEABILITY, MAGNETIC. See **MAGNETISM**.

PERMIAN SYSTEM. A name first applied by Murchison in 1841 to a group of rocks occurring in the Province of Perm, Russia. The strata which he included under this name had up to that time been considered as a division of the Triassic. In Russia the Permian strata occupy an area twice the size of France, and they are also largely developed in Germany and in England. In Germany, where the strata are naturally divided into two great series, the name *Dyas* is commonly applied to the system. In the United States the Permian succeeds the Carboniferous without any notable break in the sedimentary accumulations, so that the division must be made largely upon the evidence afforded by fossils, and some geologists consider it as the uppermost part of the Carboniferous system. The present tendency, however, is to follow the European classification and to give it independent rank as one of the main divisions of the Paleozoic group. The Permian system includes the Upper Barren measures in the Appalachian area, consisting of 1000 feet of sandstones and shales, and various formations in Missouri, Kansas, Nebraska, and Texas, which range up to 5000 feet thick. In Kansas the beds include important deposits of gypsum and rock salt. Consult Williams, "Correlation Papers, Devonian and Carboniferous," in *United States Geological Survey, Bulletin 80* (Washington, 1891). See **CARBONIFEROUS SYSTEM**.

PERMIT' (corruption of *Sp. palometa*). A West Indian fish, the great pompano (*Trachinotus goodii*), also called palometa. See **POMPANO**.

PERMUTATIONS AND COMBINATIONS (Lat. *permutatio*, from *permutare*, to change entirely, from *per*, through + *mutare*, to change, frequentative of *movere*, to move, Skt. *mv*, to push). The different groups of r things which can be selected from a collection of n different things, without reference to their arrangement, are called the *combinations* of n things taken r at a time. For example, the combinations of the four letters a, b, c, d taken 3 at a time are abc, abd, acd, bcd ; taken 2 at a time ab, ac, ad, bc, bd, cd . The different groups of r things which can be selected from n different things, varying the arrangement in every possible manner, are called the *permutations* of n things taken r at a time. For example, the permutations of the letters a, b, c taken 2 at a time are ab, ba, ac, ca, bc, cb . The number of combinations of n things taken r at a time may be indicated by the symbol C_r^n . The number of permutations of n things taken r at a time may be indicated by the symbol P_r^n . The chief properties of permutations and combinations are: 1. The number of permutations of n different things taken r at a time is $n(n-1)(n-2) \dots (n-r+1)$. For example, the number of permutations of the letters of the word "courage" taken three at a time is $7 \cdot 6 \cdot 5 = 210$. 2. The number of permutations of n things taken all together is $n(n-1)(n-2) \dots 3 \cdot 2 \cdot 1 = n!$, or, as it is commonly written in England and America, $n!$. 3. The number of permutations of n different things taken r at a time, when each of the n things may be repeated, is n^r ; e.g., the

number of ways of selecting 3 numbers from 50 on a combination lock, repetitions being allowed, is $50^3 = 125,000$. 4. The number of combinations of n different things taken r at a time is

$$\frac{n(n-1)(n-2)\dots(n-r+1)}{r!},$$

or

$$\frac{n!}{r!(n-r)!}$$

e.g., 3 persons can be selected from a class of 20 in $\frac{20 \cdot 19 \cdot 18}{3!} = 1140$ different ways.

The formulas of permutations and combinations express many relations of both algebra and geometry and possess a peculiar interest in mathematics. For example, the coefficients in the binomial expansion for a positive integral exponent may be expressed by formulas of combinations thus, $(a+b)^n = a^n + C_1^n a^{n-1}b + C_2^n a^{n-2}b^2 + C_3^n a^{n-3}b^3 + \dots$. The maximum number of vertices of a general polygon of n sides is expressed by C_2^n . Also, such problems as those of combination locks, of the number of signals with a given system of signs, and of forming all possible numbers from given digits, are solved with unusual brevity by means of the formulas of permutation and combination. This subject was known to the Hindus, particularly to Bhaskara (born 1114), and is related to the subject of probability (q.v.). Its principles are often explained in textbooks under the title *Choice*. By *cyclic permutation* is meant the interchange of the elements of a function in cyclic order. For example, $(a-b) + (b-c) + (c-a)$ becomes $(b-c) + (c-a) + (a-b)$ by the cyclic interchange of a for b , b for c , and c for a .

PERN. See HONEY BUZZARD.

PERNAMBUCO, pĕr'nám-bŭŭ'kô. An eastern state of Brazil, bounded by Parahyba and Ceará on the north, Piahy on the west, Bahia and Alagoas on the south, and the Atlantic Ocean on the east (Map: Brazil, K 5). The area is 49,473 square miles. The coast region is low, and the interior is occupied by barren plateaus known as sertões, which pass into mountain ranges near the western frontier. A long reef of sandstone extends along the coast and forms a great hindrance to navigation. The rivers are mostly short and flow either eastward into the Atlantic Ocean or southward into the São Francisco River. The climate in general is healthful; it is hot and moist along the coast, hot and dry in the interior, and cool in the more elevated regions. The low strip of coast land is covered with fine forests and is the centre of population as well as of agricultural activity. Pernambuco is the leading state of Brazil in the production of cotton and sugar cane. Coffee, cacao, tobacco, fruits, and cereals are also grown. The chief industries are sugar manufacture and cotton spinning. It exports cotton, sugar, rum, coffee, cacao, and medicinal plants. There are 560 miles of railway, all in the eastern part of the state. A new line is under construction in the north-central portion. The capital and chief seaport is Pernambuco (q.v.). Pop., 1900, 1,178,150; 1913 (est.), 1,375,765.

PERNAMBUCO, or RECIFE. The capital of the State of Pernambuco, Brazil, situated on the Atlantic coast at the easternmost point of the continent (Map: Brazil, L 5). It consists of three parts connected by bridges and causeways: the oldest, or Recife proper, is built on an outlying peninsula, connected with the mainland

by an isthmus, and is the principal commercial section; the central part, called São Antonio, stands on an island between a reef and the mainland, and contains most of the public buildings; the third portion, Boa Vista, is built on the mainland, and is the residential section, with broad streets and beautiful gardens. There are several street-car lines, one of which runs to the suburb of Olinda (q.v.), the former capital of the state. Pernambuco has some of the finest churches and public buildings of the country and numerous charitable and educational institutions, the latter including a celebrated law school and an excellent secondary college. The task of remodeling and sanitation, now in process, will transform it into a modern city. The harbor proper is inclosed by a reef cut by several navigable passages, but the largest ships have to anchor in an open roadstead. Extensive port works are in progress, which will make the inner harbor accessible to all vessels. Pernambuco is the nearest to Europe of the important ports of Brazil. It is on the direct route of the trade to southern South America and is a port of call for numerous steamship lines from Europe. It is the outlet for the products of the state, the chief of which are sugar, cotton, rum, skins, coffee, and cacao. In 1912 its trade amounted to, imports 48,984,026 milreis paper (nominal value of paper milreis 32.4 cents; exchange value stated by United States Treasury Department in October, 1914, as about 25 cents) and exports 13,893,221 milreis paper. It is the seat of a United States consul. The population by the census of 1890 was 111,556, and in 1913 it was estimated at 180,000; including the suburbs, 250,000. Recife was founded in 1504. It was held by the Dutch from 1630 to 1654, but it was then a mere village and did not acquire much importance until it superseded Olinda as capital.

PERNAMBUCO WOOD. See BRAZILWOOD.

PERNAU, pĕr'nou (Russ. *Pernov*). A town in the Government of Livonia, Russia, on both banks of the river Pernau, a short distance from the Gulf of Riga, and 100 miles north by east of Riga (Map: Russia, B 3). It is a well-built town with public gardens, a Gymnasium, and a number of benevolent institutions. The trade in grain is still considerable, but the commercial importance of the port has decreased owing to the competition of the other Baltic ports. The town was founded in 1255 by the Bishop of Oesel and was a flourishing centre in the Middle Ages. It was taken by the Russians in 1710. Its fortifications have since been demolished. Pop., 1897, 12,856; 1910, 16,258.

PERNIO, pĕr'ni-ô. See CHILBLAIN.

PERNTER, pĕr'n'tēr, JOSEF MARIA (1848-1908). An Austrian meteorologist, born at Neumarkt, south Tirol, March 15, 1848. Upon graduating from the University of Innsbruck in 1864 he joined the Society of Jesus, intending to become a priest, but he resigned in 1877 and three years later took his Ph.D. in physics at the University of Vienna. Already he had devoted much attention to meteorology, teaching it in the university, and serving in various capacities at the Vienna Central Meteorological Institute. In 1890 he was appointed extraordinary professor and in 1893 regular professor of cosmical physics at the University of Innsbruck, where he remained until 1897. During this period he founded a model Institute for Cosmical Physics, established regular meteorological ob-

servations, and continued his investigations into the nature of the foehn, the change of the psychrometric constant with pressure, and carried out radiation observations at both high and low levels. At Innsbruck, also, Pernter further developed that interest in meteorological optics which later bore fruit in the form of the most comprehensive and orderly treatise on the subject that had ever appeared. His *Meteorologische Optik* began to issue from the press in 1902; it was completed in 1910, after his death, by one of his younger Vienna associates. While at Innsbruck he also prepared a German translation of Abercromby's *Weather*.

Pernter was appointed professor of terrestrial physics at the University of Vienna in 1897 and at the same time was made director of the Central Institute of Meteorology and Earth Magnetism. During the next 10 years he more than doubled the size and resources of the institute, reorganized its management, added a reading room, a laboratory, and a printing office, and established a free telegraphic weather-warning service throughout Austria during the season April 1 to September 30. He also secured the transfer to the Central Meteorological Institute of the extensive system of seismological stations previously maintained by the Imperial Academy of Sciences. About this time, also, the title of the institute was changed to indicate the increased scope of its functions; it became the Central Institute of Meteorology and Geodynamics. With Trabert, he made an important report to the Conference of Experts at Graz in 1902, completely discrediting weather shooting as a protection against hail. Pernter died after a long illness, at Arco, south Tirol, Dec. 20, 1908. Among his important works, besides *Meteorologische Optik*, are: *Ueber den taglichen und jährlichen Gang des Luftdruckes auf Berggipfeln und in Gebirgstälern* (1881); *Ueber die Häufigkeit, die Dauer und die meteorologischen Eigenschaften des Fohns in Innsbruck* (1895); *Untersuchungen über das Wetterschiessen* (1900). Consult a biographical sketch with portrait and bibliography, in *Meteorologische Zeitschrift* (Brunswick, May, 1909), pp. 193-198.

PÉRONNE, pá'rón'. A fortified town and the capital of an arrondissement in the Department of Somme, France, on the Somme, 94 miles north by east of Paris (Map. France, N., H 3). It has a restored sixteenth-century church, a mediæval castle, and a communal college. It manufactures sugar, oil, and machinery. Charles the Simple and Louis XI were imprisoned here. The town was unsuccessfully besieged by the Imperialists under the Count of Nassau in 1536 and acquired the name of La Pucelle (the impregnable), but in 1815 it surrendered to the English under Wellington. The town was almost destroyed by the Germans, to whom it surrendered, in 1871; it has since been rebuilt. Péronne was captured by the Germans in the European War which began in 1914. See WAR IN EUROPE. Pop., 1901, 4661; 1911, 4691.

PERONOSPORA/CEÆ (Neo-Lat. nom. pl., from *Peronospora*, from Gk. *περόνη*, *peronē*, brooch, pin + *σπόρος*, *sporos*, seed), DOWNY MILDEWS. A family of six or seven genera of fungi belonging to the Phycomyces (q.v.) and parasitic upon higher plants such as tomato, potato, grape, lettuce, etc., which from the abundance of their aerial conidia give an appearance of whitish down on the attacked leaves. Hence the popular name. Their mycelium pene-

trates every part of the host, and warm moist weather favors their growth. The principal genera are represented by potato rot (*Phytophthora*), grape mildew (*Plasmopara*), and mildews of peas, beans, spinach, etc. (*Peronospora*).

PEROSI, pá-rō'zē, LORENZO (1872-). An Italian organist and composer of sacred music, born in Tortona. The greater part of his musical education was obtained at the Milan Conservatory, and in 1894 he attended Haberl's Domchorschule at Regensburg. Meanwhile he had studied for and been admitted to the priesthood. He was appointed maestro di cappella at Imola in 1895 and in 1897 at San Marco in Venice. In 1897 he produced a sacred trilogy, *La passione di Cristo*, which made him famous throughout Italy and secured him the signal honor of appointment to be conductor of the Pontifical Chorus at the Sistine Chapel. Other compositions include: *La trasfigurazione del nostro Signore Gesù Cristo* (1898); *La risurrezione di Lazaro* (1898); *Il natale del Redentore* (1899), *Moses* (1901); *Il giudizio universale* (1903); *Transitus Animæ* (1907); *In Patris Memoriam* (1910); a requiem and about 25 masses; a set of variations for orchestra; and numerous compositions for organ.

PÉROUSE, pá'rōōz', LA. A French navigator. See LAPÉROUSE.

PEROWNE, pe-rōun', JOHN JAMES STEWART (1823-1904). A British prelate and author, born at Burdwan, Bengal, where his father was a missionary of the Church Missionary Society. He was educated at Corpus Christi College, Cambridge, graduated (1848) as Tyrwhitt Hebrew scholar, and in the same year became a priest in the Church of England. He lectured on divinity at King's College, London, and in 1875 was appointed honorary chaplain to the Queen and Hulsean professor of divinity. A member of the Old Testament Revision Committee (1870-84) and Bishop of Worcester (1890-1901), he edited the *Cambridge Bible* (and *Greek Testament*) for Schools and Rogers on the *Thirty-Nine Articles*, and wrote: *The Book of Psalms: A New Translation* (1864); *Immortality* (1868), the Hulsean lectures; and an elementary Arabic grammar, *Al Adjrumiieh*.

PEROXIDASE. See OXIDASE.

PEROXIDE OF HYDROGEN. See HYDROGEN; HYDROGEN DIOXIDE; OXYGEN, IN MEDICINE.

PERPENDICULAR (Lat. *perpendicularis*, vertical, from *perpendiculum*, plumb line, from *per*, through + *pendere*, to hang). A line is said to be perpendicular to another line when it makes a right angle with it. A line is said to be perpendicular to a plane when it makes a right angle with every line in the plane passing through the point of intersection. One plane is said to be perpendicular to another when their dihedral angle (see ANGLE) is a right angle. See NORMAL.

PERPENDICULAR STYLE. The name given to the style of Gothic architecture in England which succeeded the Decorated style. It prevailed from the last quarter of the fourteenth century to the middle of the sixteenth and was thus contemporary with the Flamboyant (q.v.) style in France. While, however, the Flamboyant is distinguished by the flowing lines of its tracery, the Perpendicular is remarkable for the stiff and rectilinear lines from which its name was derived. The vertical lines of the window tracery are multiplied and emphasized,

and the mullions are frequently crossed by horizontal bars. The windows are made as large as possible and usually terminated above with the four-centred arch. The moldings are usually thin and hard and present in their shallow recesses and meagre lines a great contrast to the deep shadows and bold moldings of the earlier styles. Decorative tracery is carried over the wall surfaces, and minute crenelations, treated as pure ornaments, form the favorite parapet decoration and cresting. The art of masonry was well understood during the Perpendicular period, and the vaulting was admirably built. Fan vaulting (q.v.) belongs to this style. Doorways are commonly framed in above by a square inclosure formed by a heavy drip molding, with spandrels containing shields, quatrefoils, etc. There are many well-known buildings of this style, especially among the colleges at Oxford and Cambridge, and in almost every cathedral and church of importance there are some specimens of it. The most notable examples are the chapel of King's College at Cambridge, that of St. George at Windsor, and that of Henry VII at Westminster. Open timber roofs are among the peculiar and beautiful features of the architecture of this period. The roof of Westminster Hall, built by Richard II, was the largest example ever erected. Consult the authorities referred to under EARLY ENGLISH.

PERPET'UA, SAINT. See FELICITAS, SAINT.

PERPETUAL MOTION (Lat. *perpetualis*, permanent, universal, from *perpetuus*, continuous, universal, from *per*, through + *petere*, to seek). Under the name of perpetual motion is understood a mechanism which of and for itself, without outside aid, would continue to operate until it wore out. A water wheel under Niagara is not such a machine, because it is the sun which makes the wheel go by raising the water. Such a machine is incompatible with the principle of the conservation of energy, for some energy would always be converted into heat by friction and this would ultimately stop the machine unless its equivalent were supplied from somewhere. The most varied attempts have been made to disregard this principle and construct such a machine. A large class is that which includes all possible combinations of levers and wheels and worms and pumps, and which invariably reduces to the possibility of a man lifting himself by his boot straps. Many have tried to employ magnetism in some way. The forces of capillarity and gravitation have been harnessed in the most roundabout ways, but whatever means or agents are employed the aspect of the situation cannot be changed. See **ENERGETICS**.

PERPETUITY (Lat. *perpetuitas*, continuity, from *perpetuus*, continuous, universal). In a general and inexact sense such a limitation of property as suspends the full ownership and power of disposition beyond the period allowed by law. Properly the "rule against perpetuities" is a common-law rule forbidding the creation of future interests in real or personal property, subject to such contingencies that they may not become vested within a reasonable limited time, arbitrarily fixed by law. It is, therefore, a rule against remoteness of vesting, designed to prevent indefinite control of property by a present owner, by means of provisions in a will or deed to take effect after his death. However, through a misconception of the original object of the rule, the same name has also been applied to

laws prohibiting the suspension of the absolute power of alienation of property for a prescribed period.

By the early English law a man might create future interests in his property as remainders to take effect upon the termination of one or more precedent estates for life or in fee tail. Such dispositions were not in general objectionable on the ground of remoteness, for the reason that if they followed a present fee tail or if they were contingent they were destructible at the will of the tenant in possession. But the invention of uses (q.v.) of land and the practice which grew up of creating future estates not restricted, as remainders were, by dependence on a precedent estate for life or in tail, rendered it possible to create estates to take effect on a contingency at a remote time in the future, either as a springing or a shifting use or an executory devise, which were not, like contingent remainders, destructible by the tenant in possession. Thus, a person might devise an estate to the first of his descendants who should take holy orders; or to A and his heirs so long as they should bear the name of the testator, the lands to go to a charity if A or his heirs should ever cease to bear such name. Besides making the absolute ownership of land impossible in many cases, the shifting of an estate from one person to another on a contingency that might happen at any time in the future violated the principle that an estate once settled should not be divested after a long period of enjoyment, and accordingly the rule above referred to was gradually molded by the courts to restrict the practice.

The first important case on the point was the Duke of Norfolk's Case, decided in 1685, which held that a future contingent estate not a remainder, which was to vest at the expiration of a life in being, was not objectionable as a perpetuity. The period within which springing or shifting uses or executory devises must take effect was later extended to include a gross term of 21 years, in addition to a life or lives in being. For example, if A devises property to his son B for life, remainder to his grandson C for life, and that the property then go to the eldest son of C when he shall attain the age of 21 years, the devise will be held good if C is born prior to the death of A, the testator, as the will takes effect then, and the estate will finally vest absolutely within the period prescribed by the rule, i.e., lives in being and 21 years. However, if the property is devised to B for life, and after his death to his eldest son when the latter shall marry, assuming that B has no son at the death of A, the devise is bad, because if a son is born to B, he may not marry within 21 years after the death of B, and as B is the only life in being at the time of A's death, the estate must vest within 21 years after B's death. The possibility that B's eldest son may marry within 21 years will not save the devise, as its validity is determined by the possibilities which may happen under its terms, tending to make it bad, and not by the fact that in the course of actual events the estate may become vested within the prescribed period. The same principle applies also to personal property.

The attempt of an English gentleman, Mr. Thellusson, to create an enormous fortune by directing the accumulation of the income of his property during the lives of his children, grandchildren, and great-grandchildren, led to a stat-

ute, known as the Thellusson Act (39 and 40 Geo. III, c. 98), which forbids the accumulation of income for a longer time than the life of the grantor or settler, or for 21 years from the time of his death.

The English common-law rule against perpetuities above stated is still the law there and in most of the United States. However, in several States the common-law rule has been radically altered by statute so as to forbid a suspension of the absolute power of alienation for a longer period than two lives in being and 21 years. In New York the statute fixes the period at two lives in being and a period of a minority, as distinguished from a gross term of 21 years. For a more comprehensive treatment of the subject, see Gray, *Rule against Perpetuities* (2d ed., Boston, 1906); also consult the authorities referred to under REAL PROPERTY.

PERPIGNAN, pār'pènyàn'. The capital of the Department of Pyrénées-Orientales, France, and a fortress of the first rank, on the Têt, 5 miles from the Mediterranean and 35 miles south of Narbonne (Map France, S., G 6). It commands the passage by the eastern Pyrenees from Spain into France and is defended on the south by a citadel and by ramparts flanked with bastions and protected by raised works. Within the walls of the citadel is a thirteenth-century chapel, now used as an arsenal. The houses are of semi-Moresque construction, and there are many evidences of Spanish influence. The Spanish cathedral of St. Jean, a massive building, begun in the thirteenth century, has elaborately decorated altars and a large nave. The belfry of St. Jacques and the Castiller (used as a military prison), on the north side of the town, with its battlements and machicolations, are interesting. The old university building contains a museum with original photographic prints by Daguerre and a city library of 35,000 volumes. Perpignan has a college, a meteorological and seismological observatory, a teachers' institute, a priests' seminary, a girls' industrial school, a botanical garden, and is the see of a bishop. There are vineyards, olive groves, orchards, and gardens in the vicinity; manufactures of woolen cloths, paper, chocolate, corks, bells, and furs are carried on. Pop., 1901, 36,157, 1911, 39,510. Perpignan is first heard of in the tenth century. As capital of the former County of Roussillon, it remained long in the hands of the kings of Aragon and of Spain. The town was taken by the French in 1642 and united to France in 1659.

PERRAUD, pār'rô', JEAN JOSEPH (1819-76). A French sculptor, born at Monay in the Jura. He studied in Lyons and at the Ecole des Beaux-Arts in Paris under Pradier, Ramey, and Dumont and won the Prix de Rome in 1847. His work is carefully executed but thoroughly academic. His sculpture includes "Justice," in the Palais de Justice, Paris; "Lyric Drama," on the façade of the Opera House, Paris; "Day," Avenue de l'Observatoire, Paris, "The Infancy of Bacchus" and the bas-relief "Saying Farewell," both in the Louvre. He was for many years a popular teacher at the Beaux-Arts and was made Officer of the Legion of Honor in 1867.

PERRAULT, pār'rô', CHARLES (1628-1703). A French critic, best known for his *Mother Goose Stories*, the classic nursery tales of France. He was born Jan. 12, 1628, in Paris and was prepared for the bar, but soon turned to letters, winning distinction and an election to the Academy through his verses and the

patronage of Colbert, who made him head of the Royal Bureau of Architecture. He achieved notoriety in 1687 by a poem on *Le siècle de Louis le Grand*, which praised new writers at the expense of the old and so brought on the controversy between the ancients and moderns. Attacked by Boileau-Despréaux (q.v.), he defended himself in a series of dialogues, *Parallèle des anciens et des modernes* (1688-96), of more ingenuity than critical value. Better are his 200 studies of *Les hommes illustres qui ont paru en France pendant ce siècle* (1696-1701). But all these, with his *Mémoires* (1749) and two comedies, are insignificant beside the *Mother Goose Stories* (1697), through which the literary world first learned to know the *Sleeping Beauty*, *Little Red Riding-Hood*, *Blue-Beard*, *Puss in Boots*, *Cinderella*, and *Tom Thumb*, which, with Madame d'Aulnoy's *Goldilocks* and Madame de Beaumont's *Beauty and the Beast* and *Prince Darling*, form an indispensable part of the world's nursery library. Perrault published these stories under the name of his son, Pierre Perrault d'Armancoeur, and called them *Histoires ou contes du temps passé*, with the subtitle *Contes de ma mère l'Oye*. Perrault no more invented his stories outright than the Grimm brothers did theirs, nor did he intend to make a contribution to the knowledge of folklore. He drew on oral tradition, but he treated his matter in French fashion and set off fairly fancies with touches of playful realism.

There are many editions of Perrault's *Contes*. The best is probably that of Andrew Lang, *Popular Tales* (London, 1888), with a careful introduction of 115 pages. Consult also Deulin, *Contes de ma mère l'Oye avant Charles Perrault* (Paris, 1879).

PERRAULT, CLAUDE (1613-88). A French architect, born in Paris. He became a doctor of medicine, but later turned to architecture, designing, among many works, the eastern façade of the Louvre quadrangle, including its famous colonnade (completed, 1674), his design being substituted for that of Bernini (q.v.) after work had been begun upon the latter; the southern façade of the Louvre; the Observatory of Paris; and an arch of triumph at the gate of Saint-Antoine (destroyed in 1716). Perrault wrote: *Deux livres d'architecture de Vitruve, corrigés et traduits nouvellement en français* (1673); *Ordonnance des cinq espèces de colonnes selon la méthode des anciens* (1683; Eng. trans. by John James, *A Treatise of the Five Orders of Columns in Architecture*, 1708).

PERRENOT, pār'nô', ANTOINE, LORD OF GRANVELLE. See GRANVELLE.

PERRENS, pār'ràn', FRANÇOIS TOMMY (1822-1901). A French historian, born at Bordeaux. He received his early education in his native place and was a pupil at the Ecole Normale from 1843 until 1846, when he went to teach at Bourges, then at Lyons (1847) and at Montpellier (1850). From 1853 he was professor at the Bonaparte Lyceum, Paris, and he was inspector of the Academy from 1873 until his retirement in 1891. The thesis *Jérôme Savonarole* (1854), which he wrote for his degree (doctor of letters), was crowned by the Academy, and he published also: *Etienne Marcel et le gouvernement de la bourgeoisie au XIV^{ème} siècle* (1880); *Les mariages espagnols sous le règne de Henri IV* (1869); *La démocratie en France au moyen âge* (1873); *Histoire de Florence jusqu'à la domination des Médicis* (1877-84); *Histoire de Flor-*

ence depuis la domination des Médicis jusqu'à la chute de la république (1888-90); *La civilisation florentine du XIII^e au XVI^e siècle* (1893); *La littérature française au XIX^e siècle* (1899).

PERRERS, pĕr'ĕrz, ALICE (called also DE WINDSOR) (?-1400). The mistress of Edward III of England. She is said to have been the daughter of Sir Richard Perrers of Hertfordshire and probably married William de Windsor in 1376. She acquired her influence over the King during the lifetime of Queen Philippa, to whom she was lady of honor. The King made her valuable presents, but she became engaged in constant disputes with the courts in her endeavors to acquire maintenance and landed property, and she also used her influence politically to overthrow her enemies or uphold her favorites. She was sentenced to banishment by Parliament, but the decree was not enforced. After Edward's death her sentence of banishment was confirmed by Richard II's first Parliament, but was revoked in the following year, and she subsequently regained favor at court. Her quarrels with the abbey of St. Albans led to scurrilous attacks on her character by the monastic chroniclers, but she is praised by the historians Barnes, Carte, and Cotton and has never lacked defenders. See EDWARD III.

PERRET, FRANK ALVORD (1867-). An American volcanologist. He was born at Hartford, Conn., and was educated at the Brooklyn (N. Y.) Polytechnic Institute. In 1886 he became an assistant in Edison's East Side Laboratory and later invented the Perret electric motor. Taking up volcanology in 1904, he became an honorary assistant to Professor Matteucci (q.v.) in the observatory on Mount Vesuvius, Italy, where he witnessed the eruptions of 1906. He was present at the eruption of Stromboli in 1907, visited Messina after the earthquake in 1908, and saw the eruptions of Teneriffe in 1909 and Mount Etna in 1910. In 1911 he directed the expedition of the Massachusetts Institute of Technology to the Hawaiian Islands, where he lived beside the crater of Kilauea during the summer of that year. In 1913 he was burned by lava, though not seriously, while studying the volcano of Sakura-Jima, Japan. His main headquarters after Matteucci's death, as before, was Naples.

PERRIER, (JEAN OCTAVE) EDMOND (1844-). A French zoölogist, born near Tulle (Corrèze). In 1867 he became professor in the Lycée d'Agen, in 1872 maître de conférence at the Ecole Normale in Paris, in 1876 professor of zoölogy at the Museum of Natural History, and later director of the Museum. He became president of the section of natural science in the Ecole Pratique des Hautes-Etudes. In 1892 he was elected to the Académie des Sciences. Perrier suggested certain new nomenclatures in morphology—mérie, zoide, and dème. He published *Les colonies animales et la formation des organismes* (1881; 2d ed., 1898); *Les principaux types des êtres vivants, etc.* (1882); *La philosophie zoölogique avant Darwin* (1884); *Éléments de zoölogie* (1886; 8th ed., 1899); *Traité de zoölogie* (1892-1903); *La vie des animaux illustrée* (1903-06); *La femme dans la nature et l'évolution du sexe féminin* (1908).

PERRIN, BERNADOTTE (1847-). An American classical scholar, born at Goshen, Conn. He graduated at Yale in 1869 and was a student at the universities of Leipzig and Berlin

(1876-79). From 1881 to 1893 he served as professor of Greek in Western Reserve University and then went to Yale to occupy a similar chair. At this institution he held the Lampson professorship of Greek literature and history from 1901 to 1909. In 1896 he was elected president of the American Philological Association. His published works include an edition of *Cæsar's Civil War* (New York, 1882); *Homer's Odyssey* (i-iv, Boston, 1889; v-viii, ib., 1894); *Plutarch's Lives of Themistocles and Aristides*, translated with introduction and commentary (New York, 1901), and of *Plutarch's Lives of Nicias and Alcibiades* (New York, 1912). In 1915 he published the first two volumes of a 10-volume translation of Plutarch in the Loeb Classical Library. He was also joint editor of the "Twentieth Century Series of Text-Books."

PERRIN, FRANÇOIS NICOLAS AUGUSTIN FEYEN-. See FEYEN-PERRIN, F. N. A.

PERRIN, pĕr'ân', JEAN (1870-). A French physicist, born at Lille. He taught at the Ecole Normale Supérieure at Sèvres and became lecturer in physical chemistry in the Faculty of Sciences, Paris. Perrin was visiting French professor at Columbia in 1913 and was awarded the honorary degree of doctor of science. He wrote: *Sur les rayons cathodiques et les rayons X* (1897); *Cours de chimie physique* (1903); *Recherches sur les colloïdes et l'électrisation de contact* (1905); *Recherches sur le mouvement brownien et la détermination des poids absolus des molécules* (1909; Eng. trans. by F. Soddy, *Brownian Movement and Molecular Reality*, London, 1910); *Les atomes* (4th ed., 1914), translated into English and German.

PERRINE, pĕr-rin', CHARLES DILLON (1867-). An American astronomer, born at Steubenville, Ohio. He went to California in 1886, served as secretary (1893-95), assistant astronomer (1895-1905), and astronomer (1905-09) at the Lick Observatory, was a member of eclipse expeditions to Georgia (1900), Spain (1905), and Flint Island (1908), and had charge of the Lick expedition to Sumatra in 1901. In 1909 he became director of the Argentine National Observatory. Perrine is known particularly for his discovery in 1901 of the extraordinary motion in the nebulosity about the New Star in Perseus and also for his discovery of the sixth and seventh satellites of Jupiter and of 13 comets. He received the Lalande prize and gold medal from the French Academy of Sciences in 1897.

PER'IS, GEORGE HERBERT (1866-). An English publicist, born in Liverpool, the son of a clergyman. When 17 he went into journalism and in 1885 became editor of the *Hull Express*. After 10 years on the editorial staff of the *Speaker* (London) he was editor of *Concord* (1898-1906) and foreign editor of the *Tribune* (1906-07) and of the *Daily News* (1908-10). He was a prominent pacifist and a founder of the Anglo-German and Anglo-Russian friendship committees. He wrote: *The Eastern Crisis and British Policy* (1897); *Leo Tolstoy, the Grand Mujik* (1898); *A History of the Peace Conference at The Hague* (1899); *Life and Teaching of Tolstoy* (1901); *Blood and Gold in South Africa* (1902), an answer to Conan Doyle; *Russia in Revolution* (1905); *Short History of War and Peace* (1911); *Germany and the German Emperor* (1912); *The Industrial History of Modern England* (1914); *The Campaign of 1914 in France and Belgium* (1915).

PERRON, pâr'rôn', ANQUETIL DU. See ANQUETIL-DUPERRON.

PERRONE, pâr-rô'nâ, GIOVANNI (1794-1876). An Italian theologian. He was born at Chieri in Piedmont and, after completing his education with the doctor's degree in theology at the University of Turin, he was (in 1815) one of the first to enter the Society of Jesus after its reestablishment. He was professor of dogmatics at Orvieto, and from 1833 to 1848 at the Roman College. At the outbreak of the Revolution in the latter year he took refuge in England, but returned to his professorship when order had been restored, and became rector of the college in 1853. He acquired a reputation for great theological learning, was theologian to several of the Roman congregations, and had an important share in the condemnation of Hermetism (see HERMES, GEORG) and in formulating the doctrine of the Immaculate Conception. His most famous work is *Prælectiones Theologicæ* (9 vols., 1835-42). A compendium in two volumes has been published in 47 editions. Some of the most important of his many works are: *De Immaculato B. V. Mariæ Conceptu* (1847); *Il protestantismo e la regola di fede* (1853); *De Domini Nostri Jesu Christi Divinitate* (1870); *De Romani Pontificis Infallibilitate* (1874).

PERRONET, EDWARD (1721-92). An English hymn writer. He was born at Sundridge, Kent, a son of Vincent Perronet (q.v.). He became an itinerant preacher under the Wesleys in 1749, but the publication of *The Mitre* (1757), a bitter satire on the Church of England, caused a rupture and he joined Lady Huntingdon's connection in 1771. He left it shortly after and became minister of a small independent chapel at Canterbury, where he died. He is remembered as the author of the hymn "All hail the power of Jesus' name," which first appeared anonymously in the *Gospel Magazine* (1780). Collections of his hymns and poems have been published. Consult the article by Grosart in John Julian, *Dictionary of Hymnology* (rev ed., New York, 1907).

PERRONET, pâr-rô'nâ', JEAN RODOLPHE (1708-94). A French engineer and bridge builder, born at Suresnes (Paris). In 1747 he was appointed director of the Ecole des Ponts et Chaussées and he served as inspector general of harbors from 1757 to 1786. With Hippeau, whom he succeeded in 1763 as chief royal engineer, Perronet began the construction of the great bridge at Orléans in 1748. He designed bridges at Nemours, Nantes (1764), Nogent-sur-Seine (1766), and, at Paris, the Pont de Neuilly and the Pont Louis XVI (1786), now the Pont de la Concorde. Consult his *Description des projets de la construction des ponts de Neuilly, de Nantes, d'Orléans, et autres* (3 vols., 1782-80). Perronet had charge also of the construction of the Burgundy Canal and of the great sewerage system of Paris.

PERRONET, VINCENT (1693-1785). An English clergyman. He was born in London, of Swiss-French descent; was educated at a school in the north of England and at Christ College, Oxford, where he graduated in 1718; he took orders in the Church of England and became curate in the Parish of Sundridge, Kent. Nine years later he received the vicarage of Shoreham, which he retained for over half a century. He identified himself with the Methodist movement to such an extent that Charles Wesley

called him "the archbishop of Methodism." Perronet wrote several works in defense of the Methodists, also two in vindication of John Locke.

PERRROT, pâr'rô', GEORGES (1832-1914). A French archaeologist, born in Villeneuve-Saint-Georges (Seine-et-Oise) and educated at the normal school and the French school at Athens. In 1861 he went on an archaeological expedition to Asia Minor, in 1875 became professor of archaeology in the Sorbonne, and in 1889 director of the higher normal school. Later he was chosen permanent secretary of the Academy of Inscriptions. The most important fruit of his first journey in Asia Minor was the reconstruction of the text of the *Monumentum Ancyranum*. The results of his study of inscriptions appeared as *Exploration archéologique de la Galatie et de la Bithynie* (1862-72). With Chipiez he wrote the valuable *Histoire de l'art dans l'antiquité* (1882 et seq.); at the time of his death he was working on volume xi. Alone he wrote, apart from contributions to reviews and especially to the *Revue Archéologique*, of which he became an editor, *Essai sur le droit public et privé de la république athénienne* (1867), *Les peintures du Palatin* (1872); *Mémoires d'archéologie, d'épigraphie et d'histoire* (1875); *Lettres de Grèce* (1908).

PERRROT, SIR JOHN (c.1527-92). An English general, Lord Deputy of Ireland. He was born at Harroldston and was probably a natural son of Henry VIII. He was made a Knight of the Bath by Edward VI, and under Mary was imprisoned for his Protestant sympathies. Elizabeth, in 1570, made him President of Munster, and with much bravery and energy, but little prudence or tact, he attempted to establish the English crown in Munster. In 1584 he was appointed Lord Deputy to carry out the work throughout all Ireland. Under his rule the western province was pacified, but in the north he was quite unsuccessful. In 1588 he was removed from office, charged with treasonable offers to Philip of Spain and with contemptuous speech in regard to the Queen. The first charge was entirely groundless, but on the latter count he was clearly guilty and he was condemned. He died in the Tower before the sentence could be carried out. His natural son, SIR JAMES PERRROT (1571-1637), was a prominent member of the Addled Parliament (q.v.).

PERRY. A city in Dallas Co., Iowa, 34 miles northwest of Des Moines, on the Chicago, Milwaukee, and St. Paul and the Minneapolis and St. Louis railroads (Map: Iowa, C 3). It is situated in a rich agricultural district and has manufactures of washing machines, tiling spades, cement blocks, etc. It is the seat of Jones College and has a Carnegie library. The water works are owned by the municipality. Pop., 1900, 3986; 1910, 4630.

PERRY. A village in Wyoming Co., N. Y., 56 miles by rail southwest of Rochester, on the Buffalo, Rochester, and Pittsburgh Railway (Map New York, B 5). It contains a public library, fine municipal and high school buildings, and a Masonic temple. Among the industrial establishments are knitting mills and a cutlery factory. The water works are owned by the village. Pop., 1900, 2763; 1910, 4388; 1915 (State census), 5009.

PERRY. A city and the county seat of Noble Co., Okla., 30 miles north-northeast of Guthrie, on the Atchison, Topeka, and Santa Fe

and the St. Louis and San Francisco railroads (Map: Oklahoma, D 2). It is important principally as a commercial centre, being the distributing and shipping point for an extensive farming and stock-raising district. It has a large flour mill. There are public parks and a Carnegie library. The water works and electric-light plant are owned by the city. Pop., 1900, 3351; 1910, 3133.

PERRY, ARTHUR LATHAM (1830-1905). An American economist, born at Lyme, N. H. He graduated at Williams College in 1852 and was professor of history and political economy there from 1853 to 1891, when he became professor emeritus. He advocated free trade. Among his publications are: *Political Economy* (1865; 22d ed., 1895); *International Commerce* (1866); *Introduction to Political Economy* (1877; new ed., 1890); *Principles of Political Economy* (1891); *Williamstown and Williams College* (1900). He was the father of Bliss Perry.

PERRY, BLISS (1860-). An American editor, author, and university professor, born at Williamstown, Mass., Nov. 25, 1860. He graduated at Williams College in 1881, was an instructor there for five years, studied in Germany at Berlin and Strassburg, and served as professor of English at Williams (1886-93). From 1893 to 1899 he occupied a similar position at Princeton, and thereafter for 10 years he was editor of the *Atlantic Monthly*. In 1906 he accepted the professorship of belles-lettres at Harvard, a chair formerly filled by Longfellow and Lowell. Professor Perry edited *Selections from Burke*, *Scott's Ivanhoe* and *Woodstock*, and *Little Masterpieces*, 18 volumes. He was, too, the general editor of the Cambridge editions (1905-09) of the poets; and he published several works of fiction, *The Broughton House* (1890), *Salem Kittredge* (1894), *The Plated City* (1895), and *The Powers at Play* (1899); also the chapter on poetry in *Counsel upon the Reading of Books* (1900); *A Study of Prose Fiction* (1902); *The Amateur Spirit* (1904), essays; *Walt Whitman* (1906); *Whittier* (1907); *Park Street Papers* (1908); *The American Mind* (1912); *Thomas Carlyle: How to Know Him* (1915). Professor Perry received honorary degrees from several American colleges and became a member of the American Academy of Arts and Letters. His father was Arthur Latham Perry.

PERRY, EDWARD DELAVAN (1854-). An American Greek scholar, born in Troy, N. Y. He graduated in 1875 at Columbia, to which he returned in 1880 as a member of the faculty, after study at Leipzig and Tübingen. From 1891 to 1895 he was professor of Sanskrit at Columbia, and subsequently Jay professor of Greek, in 1902-09 serving also as dean of the faculty of philosophy. He held the presidency of the New York Society of the Archaeological Institute of America in 1897-1900 and in 1903-10. An authority on the subject of Greek dialects and inscriptions, Professor Perry is known also as the author of a *Sanskrit Primer* (3d ed., 1902) based on Bühler's *Leitfaden*.

PERRY, JOHN (1669-1732). An English engineer, born at Rodborough, Gloucestershire. By 1693 he had become a lieutenant in the Royal Navy on the *Montague*, and later he commanded the fire ship *Cygnet*, for losing which to the French he was court-martialed. He entered the employ of Czar Peter in 1698, engaged in canal construction between the rivers Volga and Don, in 1701 became Comptroller of the Russian Mari-

time Works, and in 1712, after a dispute regarding salary, which ended in Perry's life being threatened by Peter, he returned to England. His greatest engineering feat was the stopping of the breach in the Thames embankment at Dagenham in 1714-19 at a cost of more than £40,000. Perry published: *Regulations for Seamen* (1694); *State of Russia under the Present Czar* (1716); *An Account of the Stopping of the Dagenham Breach* (1721); *Proposals for Draining the Fens in Lincolnshire* (1727). Consult Samuel Smiles, *Lives of the Engineers* (new ed., London, 1904).

PERRY, JOHN (1850-). An English physicist and engineer. He was born in Ulster, Ireland, and was educated at Queen's College, Belfast. He was appointed professor of engineering in the Imperial College, Tokyo, Japan, in 1875, and, two years after his return to England, professor of engineering and mathematics in the Finsbury Technical College. This position he left after 15 years in 1896, and was appointed professor of mechanics and mathematics in South Kensington Royal College of Science. He became a member of the South African University Commission in 1914. Perry wrote: *The Steam Engine* (1874); *Practical Mechanics* (1883); *Spinning Tops* (1890); the Cantor lectures, *Hydraulics* (1892); *Calculus* (1897); *Applied Mechanics* (1897); *Steam* (1899); *Practical Mathematics* (1899); *England's Neglect of Science* (1901); *The Steam Engine and Gas and Oil Engines* (1902; new ed., 1909); *Elementary Practical Mathematics* (1913); besides many contributions to English scientific periodicals.

PERRY, MATTHEW CALBRAITH (1794-1858). An American naval officer, brother of Oliver Hazard Perry (q.v.). He was born at Newport, R. I., entered the navy as a midshipman in 1809, and early in the War of 1812 was one of the officers of the frigate *President*. In 1813 he was transferred to the *United States*, which was blockaded in the harbor of New London until the conclusion of peace. He was then for several years engaged in the merchant service, but, having reentered the navy, he was in 1819 appointed executive officer of the *Cyane*, which convoyed the *Elizabeth* with her band of pioneers to Liberia. Two years later he was again on the African coast as commander of the *Shark*, and recommended the removal of the Liberian colonists from Sherbro to Monrovia. On his return from this voyage, and again in 1822, he took an active part in extirpating piracy in the West Indies. In 1824 he was appointed executive officer of the *North Carolina*, Commodore Rodgers's flagship on the Mediterranean station. He was promoted to the rank of commander in 1826, and in 1832 was again sent to the Mediterranean as captain of the *Concord*. From 1833 to 1843 he was stationed at the Brooklyn Navy Yard. Under his superintendence was built the *Fulton* (the second of the name), a paddle wheel steamer of about 1200 tons, and the first steam vessel with a hull of ordinary type built for the United States navy. When she was completed in 1837 he took command of her, organized her personnel, and so thoroughly demonstrated the practical utility of steam as a motive power for war vessels that he earned the title of Father of the Steam Navy. In this same year he was commissioned captain and in 1839 was sent abroad to study the latest English and French steam warships. In 1841 he was promoted to be commodore and two years later was

assigned to the command of the squadron on the African coast maintained by the United States for the suppression of the slave trade. During the early part of the Mexican War he served under Commodore Conner in the Gulf, but on Conner's recall in 1847 Perry succeeded him in the command of what was then the largest fleet of warships ever assembled under the American flag. In 1852 he was sent by President Fillmore with a squadron of warships to Japan to induce that country to enter into relations with the nations of the West. His flagship, the *Mississippi*, was the first United States steam war vessel to circumnavigate the globe. He arrived in Kurihama, in the Bay of Yeddo, on July 7, 1853, and on the 14th delivered to representatives of the Shogun the letter addressed to the ruler of Japan, which declared the nature of his mission. He then went to China, and returning in February, 1854, concluded a treaty with the Japanese by which they agreed to receive an American consul at one of their ports. This treaty, which was followed by one between Japan and Great Britain, inaugurated a new era in the history of Japan. Perry's report was printed by the government in three volumes, under the title *The Report of Commodore Perry's Expedition to Japan* (1856). He died in New York City in 1858. A monument to his memory was unveiled at Perry Park, Kurihama, Japan, on July 14, 1901. Consult W. E. Griffis, *Matthew Calbraith Perry, a Typical American Naval Officer* (Boston, 1887).

PERRY, NORA (1841-96). An American poet, journalist, and writer of juvenile stories, for some years Boston correspondent of the *Chicago Tribune*. She was born in Dudley, Mass. Her verse is collected in *After the Ball* (1875), *Her Lover's Friend* (1879), *New Songs and Ballads* (1886), *Legends and Lyrics* (1890). Her fiction, chiefly juvenile, includes *The Tragedy of the Unexpected* (1880), stories, *For a Woman* (1885), a novel; *A Book of Love Stories* (1881), *A Flock of Girls and their Friends* (1887); *The New Year's Call* (1903); and many other volumes. These are briskly told and, like her verses, appeal to the sentiment of the broader reading public.

PERRY, OLIVER HAZARD (1785-1819). A distinguished American naval officer. He was born at South Kingston, R. I., Aug. 23, 1785, and received his education partly from his mother and partly in private schools in Newport and elsewhere. He entered the navy as a midshipman in 1799, served in the war against Tripoli, and in 1807 was commissioned lieutenant. In 1811, as commander of the schooner *Revenge*, he had the misfortune to lose his vessel off Watch Hill, R. I., but a court of inquiry, which at his request investigated the circumstances connected with the wreck, reported him guiltless of any neglect of duty. During the first few months of the War of 1812 Perry commanded a flotilla of gunboats in Newport harbor, but was later transferred to Sacketts Harbor, N. Y., and thence was soon ordered to Presque Isle (now Erie) to take charge of the construction of a fleet, with which the Americans hoped to wrest from the British the control of Lake Erie. By great exertions he succeeded by the end of the summer of 1813 in building and manning a squadron of nine vessels, with which, on the 10th of September, he won the celebrated battle of Lake Erie. His dispatch announcing the victory ran: "We have met the enemy and

they are ours. Two ships, two brigs, one schooner, and one sloop." (See *ERIE, BATTLE OF LAKE*) He was then able very materially to assist General Harrison in the operations culminating in the battle of the Thames. As a reward for his brilliant victory Perry received from Congress a vote of thanks, a gold medal, and the rank of captain. By the people he was regarded as one of the chief heroes of the war, and his achievement has remained one of the favorite episodes in American history. Later a bitter controversy arose between Perry and Elliott, the commander of the *Niagara*, one of Perry's vessels, over the question whether Elliott did his duty in supporting the flagship. A court of inquiry, called at Elliott's request, made a somewhat ambiguous report. Subsequently Perry preferred charges, but no action was ever taken by the Navy Department. After the close of the war Perry was placed in command of the frigate *Java* and cruised with Decatur's squadron in the Mediterranean. In 1819 he was sent with a small squadron to the West Indies to protect American commerce against pirates. While performing this duty he was seized with yellow fever and died the same year on his birthday. He was buried with military honors at Port of Spain, Trinidad, but in 1826, by order of Congress, his body was removed in the sloop of war *Lexington* to Newport, where it was reinterred with great honors. The State of Rhode Island later erected a granite monument to his memory, and there are also statues of him at Newport and at Cleveland, Ohio. In 1913 the centennial of the battle of Lake Erie was celebrated in notable style. An elaborate memorial structure was unveiled at Put-in-Bay. In this were reinterred the bones of American and British officers who fell in the fight. Cleveland and Newport had their own celebrations. Books descriptive of these occasions were published. Consult: J. F. Cooper, in *Lives of Distinguished American Naval Officers*, vol. II (New York, 1846), James Barnes, *The Hero of Erie* (ib., 1898); O. H. Lyman, *Commodore O. H. Perry and the War on the Lakes* (ib., 1905); A. S. Mackenzie, *Commodore Oliver Hazard Perry* (Akron, Ohio, 1910).

PERRY, PETER (1793-1851). A Canadian statesman. He was born in Lennox County, Ontario, and in early life was a farmer, later becoming a merchant at Whitby. His sympathy with the agitation for reform led him to enter politics, and he was one of the earliest advocates of responsible government. He was one of the founders of the Reform party of Upper Canada in 1824 and Reform (Liberal) member for the united counties of Lennox and Addington in 1824-36 in the Upper Canada Legislative Assembly. After the union of Upper and Lower Canada in 1841 Perry contended vigorously for responsible government in the new Province of Canada and was elected a Liberal member of the Canada Legislative Assembly. Dissatisfied with the methods of the Reform party then in power, he advocated a more radical platform and was one of the founders of the Clear Grit, or Advanced Reform, party, which included certain principles that the more moderate Reformers rejected. He sympathized to some extent with the annexation movement in 1849, but recognized that it was impracticable.

PERRY, RALPH BARTON (1876-). An American philosophical scholar, born at Poultney, Vt. He was educated at Princeton (A.B.,

1896) and at Harvard (A.M., 1897; Ph.D., 1899), where, after teaching philosophy for three years at Williams and Smith colleges, he was instructor (1902-05), assistant professor (1905-13), and professor of philosophy. A pupil of William James, whose *Essays in Radical Empiricism* he edited (1912), Perry became one of the leaders of the neorealist movement. (See REALISM.) His own writings include: *The Approach to Philosophy* (1905); *The Moral Economy* (1909); *Present Philosophical Tendencies* (1912); *The New Realism* (1912).

PERRY, ROLAND HINTON (1879-). An American sculptor and painter. He was born in New York and studied painting at the Art Students' League in that city and afterward under Gérôme in Paris. He then turned to sculpture, which he studied in Paris under Chapu and Pucch. His early plastic work, such as "Siegfried and the Dragon" and the "Fountain of Neptune," the latter in front of the Congressional Library, Washington, are vigorous and effective, though florid and carelessly executed. His later works show greater finish and skill in composition. Among the best known are: "The Lion in Love," "Circe" (1900); the Langdon doors, Buffalo Historical Society; frieze in the lobby of the New Amsterdam Theatre, New York; "Pennsylvania," on the dome of the capitol at Harrisburg (1904); memorial of New York State at Andersonville, Ga. (1910); equestrian statue of General Castleman, Louisville, Ky.; and General Wadsworth, Gettysburg. His busts, which are handled with breadth and charm, include that of his daughter and one of General Sickles. Perry's painting called "The Death of Sigurd" is in the Detroit Museum.

PERRY, STEPHEN JOSEPH (1833-89). An English astronomer, born in London. He studied theology at Douai and Rome, entered the Society of Jesus in 1853, and studied mathematics at Stonyhurst, at the University of London, and at that of Paris. In 1868 he began a magnetic survey of France. Two years afterward, as fellow of the Royal Society, he was stationed at San Antonio, Cadiz, to observe the total eclipse of that year, in 1874 he directed the observations of the transit of Venus on Kerguelen Island, and in 1882 was sent to southwestern Madagascar with another transit of Venus expedition. Perry died in the Salut Islands, where he caught a severe cold in attempting to photograph the total eclipse of Dec. 22, 1889. His generosity fitted up the Stonyhurst Observatory. Perry was an able and popular lecturer. In 1881 he discovered, independently of Trouvelot, the veiled sun spots. Consult A. L. Cortie, *Father Perry, the Jesuit Astronomer* (London, 1890).

PERRY, THOMAS SERGEANT (1845-). An American educator and literary historian, born in Newport, R. I. He graduated (1866) at Harvard, where, after studying in Berlin and Paris, he taught German (1868-72) and English (1877-81). In the interval he was for two years editor of the *North American Review*. He afterward wrote: *Life and Letters of Francis Lieber* (1883); *English Literature in the Eighteenth Century* (1883); *From Opitz to Lessing* (1884); *The Evolution of the Snob* (1886); *Greek Literature* (1890); *Life of John Fiske* (1906).

PERRY, WILLIAM STEVENS (1832-98). An American Protestant Episcopal bishop and educator. He was born at Providence, R. I., studied at Brown University, but took his degree from

Harvard in 1854. He studied theology at Virginia Seminary and was ordained priest (1858) at St. Paul's, Boston, where he spent the first year of his ministry. His succeeding charges were in Nashua, N. H., Portland, Me., Litchfield, Conn., and Geneva, N. Y. He taught history at Hobart College for several years and served the institution as president from April to September, 1876, when he was consecrated Bishop of Iowa. He did much for the cause of education in his diocese—reopened Griswold College, founded St. Katharine's Hall for girls, Kemper Hall for boys, and Lee Hall for training candidates for orders. He also founded St. Luke's Hospital at Des Moines. Among his writings are: *Documentary History of the Protestant Episcopal Church in the United States of America* (1863-64), with Dr. F. L. Hawks; *Historical Collections of the American Colonial Church* (5 vols., 1871-78); *Historical Notes and Documents Illustrating the Organization of the Protestant Episcopal Church in America* (1874); *Historical Sketch of the Protestant Episcopal Church, 1784-1884* (1884). Consult sketch and bibliography in his *Episcopate in America* (New York, 1895).

PERRYVILLE, BATTLE OF. A battle fought at Perryville, Ky., about 40 miles south of Frankfort, on Oct. 8, 1862, during the Civil War, between a Federal force of about 22,000 men, actually engaged, under General Buell, and a Confederate force of about 17,000 men under General Bragg. The Confederates opened the engagement at about two o'clock in the afternoon by an attack upon the Federal left under McCook, and for a time drove it back, but were finally forced back themselves through the town of Perryville. During the night the Confederates retired from the field. By many the engagement has been considered a drawn battle, though strategically it is generally regarded as a victory for the Federals. General Buell's forces in the vicinity of Perryville numbered about 58,000 men, less than half of whom were actually engaged in the battle. The Confederates lost, in killed, wounded, and missing, 3396; the Federals, 4211. Consult: J. B. Fry, *Operations of the Army under Buell* (New York, 1884); Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. iii (ib., 1887); J. C. Ropes, *The Story of the Civil War*, part II (ib., 1898); M. F. Steele, *American Campaigns* (Washington, 1909).

PER'SÆ (Lat., from Gk. Πέρσαι, Persians). A play of Æschylus, produced at Athens in 472 B.C., with three other dramas, *Phineus*, *Glaucus*, and *Prometheus*. It is notable as being the only extant ancient drama the subject of which is not mythological. Its subject is the defeat of the Persians, with a fine description of the battle of Salamis.

PERSECUTIONS OF THE CHRISTIANS, THE TEN. A phrase that has been in very general use since the fifth century. The number, however, has no basis in fact, and was suggested by the 10 plagues of Egypt and the 10 horns of the beast in the Book of Revelation (xvii. 3 et seq.), interpreted, in accordance with the allegorizing spirit of the time, as types of 10 emperors. There were only two persecutions coterminous with the Roman Empire and directly prompted by Imperial action, that under Decius in 250 and that under Diocletian and his associates, 303-313. On the other hand, if provincial and local persecutions be taken into

account, the number is far too small. So far as known, Claudius (41-54) was the first Roman Emperor to attempt any sort of persecution of the Christians. Suetonius states that he expelled the Jews from Rome. The reason is not altogether clear, but a very plausible interpretation is that, at this early date Christian converts being mainly Jews, the government regarded the former merely as a sect of the latter, and the decree was occasioned by disorders arising in the city because of conflicts between non-Christian and Christian Jews, leading to the expulsion of both. The date is uncertain; it has been placed in 52, but may have been earlier. (Cf. Acts xviii. 2.) The 10 persecutions as commonly given, with the date fixing approximately either the beginning or period of greatest severity, are: that under Nero, 64, under Domitian, 95; under Trajan, 112-113; under Marcus Aurelius, 177; under Septimius Severus, 202, under Maximinus, 235; under Decius, 250, under Valerian, 257; under Aurelian, 274, under Diocletian and his successors, 303-313.

Bibliography. For the sources. Preuschen, *Analecta* (Freiburg, 1893), *Translations and Reprints Published by the Department of History of the University of Pennsylvania*, vol. iv, no. 1 (Philadelphia, 1897); also: Sir W. M. Ramsay, *The Church in the Roman Empire before 170 A.D.* (London, 1894); J. A. F. Gregg, *The Decian Persecution* (Edinburgh, 1897); D. C. Munro and E. Bramhall, *The Early Christian Persecutions* (Philadelphia, 1897); Paul Allard, *Julien l'Apostat* (Paris, 1903); P. J. Healy, *The Valerian Persecution* (London, 1905); H. B. Workman, *Persecution in the Early Church* (ib., 1906); H. Spence-Jones, *Early Christians in Rome* (New York, 1911); Edward Gibbon, *Decline and Fall of the Roman Empire*, edited by J. B. Bury (London, 1912); L. H. Canfield, *Early Persecutions of the Christians* (New York, 1913); and general Church histories. See MARTYR.

PERSEPHONE. See PROSERPINA.

PERSEPOLIS (Lat., from Gk Περσέπολις, City of the Persians). The Greek name of the capital of the Persian Empire under Darius I and his successors. The actual Persian name of the place in antiquity is uncertain, but the city itself may possibly have been called Stakhra (strong), as Stakhr was its designation in Sassanian times, and Istakhr is still the current name applied to ruined remains north and northwest of the great platform on which stood the palaces of the Achaemenian kings, Darius Hystaspis, Xerxes, and the rest. The site of Persepolis is identified mainly through this splendid palace terrace and by the royal tombs in the vicinity. The platform itself is known by the natives as Takht 1 Jamshid (Throne of Jamshid), the legendary founder of Persepolis, or is called by them Chihal Minar (Forty Columns), the number 40 being simply a round figure to designate the remains of pillars, certain of which are still standing. There is some inscriptional evidence (Xerx Pers., a, 3, 14) to show that the platform may have been known as Pārsa, i.e., Persia par excellence.

The ruins of this past centre of Imperial greatness extend throughout the valley of the Medus above its confluence with the Araxes, or now respectively the Pulvar and Bendemeer (Pers. Pulwār and Band i Amr). They overlook the beautiful mountain-girt and fertile plain of Murghab, known as Mervdasht, north-

west of Lake Tashk or Nargis, and are located about 40 miles northeast of Shiraz, on the road to Ispahan; the small river Pulvar courses through much of the district. The ruins themselves are chiefly Achaemenian, supplemented by later monuments of the Sassanian period. The Achaemenian remains consist of (1) the grand platform of Takht 1 Jamshid, referred to above. It is situated at the south of the entire collection of ruins and adjoins the base of a hilly range in which are hewn in the solid rock three finely sculptured sepulchres, presumably those of the later Achaemenian kings, Artaxerxes II (Mnemon), Artaxerxes III (Ochus), and Darius III (Codomannus), the latter tomb having been left unfinished. (2) At various points north and northwest on the plain are vestiges of the city of Stakhra, the capital itself and abode of the people as opposed to the royal terrace, or capitol. Among the remains of this town, and belonging evidently to the Achaemenian era, are some pilasters, bases of columns, and a small granite staging, about 40 feet square and 8 feet high, which is called the Peacock Throne (Takht 1 Tā'us), or Rustam's Throne (Takht 1 Rustam), lying near the small modern posthouse at the hamlet of Puzah. In the Sassanian period Stakhr was an important metropolis, and Mohammedan writers between the tenth and fourteenth centuries of the Christian era still described it as an emporium, noteworthy for its bazars and for an ancient fire temple which had been converted into a mosque. The place was in ruins, however, when Pietro della Valle visited it in 1621. (3) North again on the plain and across the Pulvar, or at a distance of 5 or 6 miles from the platform, are hewn in the rocky face of a high perpendicular cliff four famous tombs, the sepulchres of the elder kings of the second line of the Achaemenidae, Darius I, Xerxes, Artaxerxes II, and Darius II. This necropolis hill, which has a sharp bend at its eastern end, was spoken of by Ctesias (*Frag.* 46) as a double mountain (δισσὸν ὄρος); but the natives today call it Husain Kuh (Mountain of Husain), or more commonly Naksh 1 Rustam (Rustam's Portrait), from a mistaken notion that the sculptures of historic Sassanian kings on horseback carved at its base represent Rustam and his famous steed. These tombs, which are hewn deep in the rock, have each the form of a Greek cross about 70 feet in height by 60 feet in width, and all four are identical in design. The tomb of Darius I is the second from the eastern end and is identified by a long cuneiform inscription, twice given. The other three tombs bear no inscriptional devices, but can be identified on archaeological grounds as the vaults of Xerxes and his immediate successors. Below the tombs, or along the base of the cliff, are seven carved panels, which date from a later dynasty, as they contain Sassanian bas-reliefs belonging to the third and fourth centuries A.D. These sculptures depict events connected with the reigns of known monarchs of the house of Sasan. Opposite the fourth or last tomb and distant from it about 20 yards is a well-preserved square building of stone dating back to Achaemenian times and wholly analogous in structure to the one in ruins at Pasargadae (q.v.). Local tradition calls this building a shrine of Zoroaster (ka'bah 1 Zardusht), and there are cogent reasons for regarding it as a sanctum designed for keeping the sacred fire, somewhat like the modern Parsi *sagri* that com-

monly adjoins a tower of silence; but some scholars prefer to regard it as an ancient mausoleum. (See PASARGADÆ.) On the western side of the necropolis cliff and near its lower ascent are two fire altars (*âtashgâhs*), hewn out of the living rock and dating from the Achaemenian period; while slightly above them on the slope is a simple low pillar, similarly hewn and belonging to the same era. Still farther up on the bluff are some seven roughly carved spaces, cut in the rock, three of them being particularly well defined; they all are presumed to have served as tables upon which the bodies of the dead were exposed to be devoured by dogs and birds in accordance with the tenets of the ancient Zoroastrian religion. This list of remains, when supplemented by a memorandum as to a sort of carved parapet of stone that is approached by five crudely cut steps at the top of the cliff, comprises all of the remains at Naksh i Rustam.

The other two sets of monuments, which are found on the plain and lie to the east and south-east of Naksh i Rustam, are of Sassanian origin. The first of these remains (4) is a celebrated inscription in Chaldeo-Pahlavi and Sassanian Pahlavi carved on two tablets in a cave near Hajiabad, about 2 miles east of the necropolis hill. This inscription appears to record a remarkable arrow shot by King Shahpur, or Sapor I (241-272 A.D.). The second of the set lies somewhat farther south and consists of a group of three bas-reliefs chiseled in a rocky recess at Naksh i Rajab. The effigy of King Sapor I forms the central figure in each of the three sculptures, and his name appears in Greek as well as in Pahlavi.

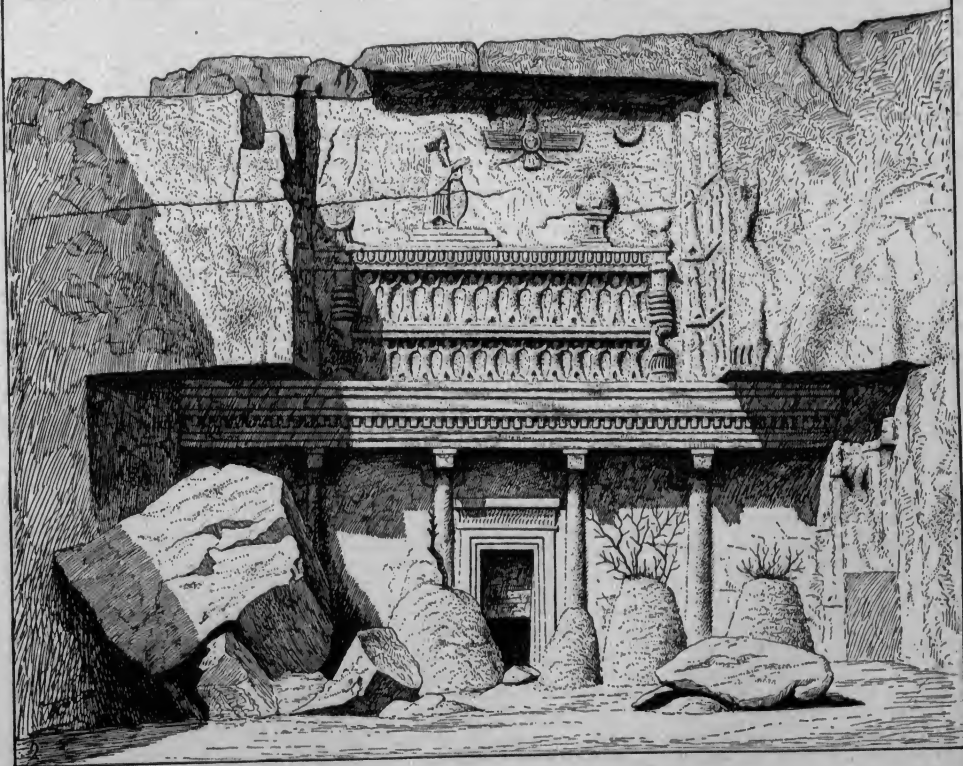
As previously indicated, Takht i Jamshid, or the platform proper, is the most important of all the ruins, as it formed the residence of the Great Kings. The spurs of the Mountain of Grace (*Kth i Rahmat*), at whose base it is located, have been partly cut away to furnish building material for this imposing terrace and the edifices that crown it. The vast substructure is over 1500 feet long from north to south (or more exactly northwest to southeast) by about 800 feet from east to west. Its retaining wall, composed of immense blocks of stone carefully masoned, varies in height from 20 to 50 feet above the level of the plain. Although legend points to some earlier occupation of the site as a royal centre, it is certain that the platform itself was erected by Darius I, having been begun about 518 B.C., but having probably required several years for completion. According to Diodorus Siculus (17, 71) it was surrounded by a triple wall of 16, 32, and 60 cubits respectively. Traces of these circumvallations, which must have been made of clay covered with glazed tilings, appear to have been found along the three exposed sides of the area; no protection was needed at the rear because of the natural fortification formed by the eastern hills. On the terrace itself there may likewise have been at certain points inner shielding barriers, because all evidence from the past indicates that the platform was not only a royal seat but also a citadel (*Elamit. halvarraš*, i.e., *OPers. didâ*).

The whole expanse of the terraced height shows three distinct elevations. The lowest, that to the south, presents no traces of ever having been built upon. The middle terrace is the highest, averaging possibly 45 feet above the plain and measuring approximately 800 feet square

It supports the most notable of the ruined edifices, the palace of Darius, a sumptuous audience hall of Xerxes, a palace of that same monarch, a palace of Artaxerxes III, and the impressive ruins of the so-called Hall of a Hundred Columns, together with some other remains of Imperial state. The northern terrace, somewhat lower in level than the middle elevation, is approached by the grand staircase, a magnificent flight of stone stairs running in a double ramp from the plain at the northwestern corner of the platform. The steps of this ascent are nearly 22 feet wide, 4 inches high, and 15 inches in the tread, with a mount so easy that travelers have often ascended them on horseback. Near the top of this stairway, or at some twoscore and more yards eastward on the floor of this terraced elevation, rise the grandiose remains of the Portal of Xerxes, a gateway composed of four massive pylons adorned by figures of colossal winged bulls, with human faces partly preserved, guarding the entrance and closely resembling the Assyrian bulls of Nineveh. Two of these mighty relics in stone look westward towards the plain, two eastward towards the hill; and between them are two fluted columns in situ, the remains of an original four that lent added dignity to the whole. Through this pompous entry the envoys of the subject nations, bearing tribute to their sovereign lord, passed in regal array to do homage to the Great King, Xerxes, at the spring festival of Nau-Ruz, or New Year's Day, as indicated by cuneiform inscriptions on the portal which call it the Porch of All Nations (*OPers. Duvarthi Visadahyu*). Near by are the remains of a ruined tank or cistern hewn in the stone. Passing south across a space of about 50 yards from the propyleum one encounters a long and elaborately carved frieze, adorned with sculptured figures of the tribute-bearing nations with their gifts, and inscribed with cuneiform tablets which serve to identify the work as that of Xerxes. This sculptured front served as a kind of stylobate for the lofty audience hall of this Great King. The popular name, *Chihal Minar* (Forty Columns), is but an Oriental round number, as stated above, for the original 70 pillars that composed the original throne room. Thirteen of these still remain upright. The general arrangement of the building shows that the central hall in Xerxes's time was supported by 36 columns and flanked on either side by rooms with 12 columns each. The average height of these shafts is 60 feet, the circumference 16 feet, and the length from the torus to the capital 44 feet. Each standing column of the set is finely fluted in 52 divisions; at the lower extremity begin a cincture and a torus, the first 2 inches in depth and the latter 1 foot, whence devolves the pedestal, shaped like the cup of a pendent lotus; the capitals, moreover, were probably once surmounted, as in the case of the Achaemenian pillars at Susa, by a double semibull. This great audience hall or throne room (*OPers. apadâna*) is computed to have occupied a rectangle of about 300 by 350 feet and thus to have covered two and one-half acres. The tiled walls of clay, built between the columns so as to form the edifice, have long since disappeared.

About 50 more yards southward and still near the western side of the platform are the clearly preserved remains of the palace of Darius, adorned by his effigy in bas-relief and identified by cuneiform inscriptions. South again of this

PERSEPOLIS



1. PALACE OF DARIUS

2. FIRST OF THE TOMBS OF THE KINGS

famous edifice and lying nearest of all to the edge of the rampart, on the other side of an open court, are found the ruins of the palace of Artaxerxes III (Ochus), which was probably one of the latest of the regal edifices and is known by inscriptions on the stairway. Directly back of it, to the east, stood the palace of Xerxes, noble in design even in its ruins.

Traversing eastward some 50 yards, over uneven ground, one finds a smaller building, known as the Southeast Edifice, the identity of which is not known with certainty, though the structure may have been erected by Artaxerxes II (so Sarre and Herzfeld, *Iranische Felsreliefs*, p. 109). From this point northward and directly in the rear of the palace of Darius is a ruined entrance hall, commonly known as the Portico of Darius, although sometimes called the Central Edifice, adorned by bas-relief sculptures of the Great King and of the vassal nations that supported his throne. Close to it on the right, or directly to the east of the audience hall of Xerxes described above, and of Darius' own palace, stand the remnants of the largest of all the stately pile of buildings. It is known as the Hall of a Hundred Columns and was erected by Darius I, even if his son Xerxes may have shared in completing it. In addition to these palatial structures there are found beneath the surface of the platform remains of several underground channels; but whether they were simply water ducts or else subterranean passages designed for other purposes has not yet been fully determined.

Concerning the stone of which the terrace itself and its edifices were made, it may be noted that the substance is a calcareous limestone hewn from the adjoining hill. Its surface admits of a high polish that causes it to resemble even porphyry or marble, as in the palace of Darius, or it takes on a hue of amber-like white, as in the remaining pillars of the great hall of Xerxes.

In reviewing the history of Persepolis it may be added that this royal metropolis, which owed its foundation to Darius and its development to Xerxes and his successors, passed through various vicissitudes in the course of ages. It fell before the conquering hosts of Alexander the Great, who spent some four months in its midst, early in 330 B.C. before he resumed his pursuit of Darius Codomannus, which resulted in that monarch's death. It is chronicled that before his departure from Persepolis Alexander, acting on the suggestion of the courtesan Thais, destroyed by fire the palaces of Takht i Jamshid. Charred remains of the cedar beams of the royal edifices seem to bear out the truth of this tradition. Still in 316 B.C. (Diodor. Sic., 19, 21-46) Persepolis remained the capital, but it gradually sank into a decline, even though it arose once more into prominence after 200 A.D. under the Sassanids and remained a considerable centre of administrative, religious, and commercial activity. At the time of the Moslem invasion it proved a formidable opponent to the armies of the Sword and the Crescent, but suffered severely; yet, as noted above, it enjoyed a certain prosperity down to the fourteenth century; by the sixteenth century, however, it had passed out of existence.

Bibliography. James Fergusson, *The Palaces of Nineveh and Persepolis Restored* (London, 1851); W. S. Vaux, *Nineveh and Persepolis* (new ed., ib., 1855); George Rawlinson, *The Five Great Monarchies*, vol. iii (ib., 1871); P. V. N.

Myers, *Remains of Lost Empires* (New York, 1875); Franz Stolz, *Persepolis* (Berlin, 1882); M. A. Dieulafoy, *L'Art antique de la Perse* (5 vols., Paris, 1884-89); Blundell, "Persepolis," in *Transactions of the Congress of Orientalists*, vol. ii (London, 1892); Curzon, *Persia and the Persian Question* (ib., 1892); Ferdinand Justi, "Geschichte Irans," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii (Strassburg, 1904); A. V. W. Jackson, *Persia Past and Present* (New York, 1906); P. M. Sykes, *History of Persia* (London, 1915); and especially Sarre and Herzfeld, *Iranische Felsreliefs* (2 vols., Berlin, 1910).

PERSEUS (Lat., from Gk. Περσεύς). In Grecian legend, the son of Zeus and Danaë (q.v.) and grandson of Acrisius, King of Argos. As Acrisius had been warned that he would perish by the hand of Danaë's son, he inclosed mother and child in a chest and cast them into the sea. They drifted to the island of Seriphos, where they were cared for by Dictys, brother of the King, Polydectes. The latter fell in love with Danaë, and as Perseus, now grown to manhood, interfered with his plans, he sent him to bring the head of Medusa. (See GORGON.) Guided by Athena, he found the Grææ, old women with but one eye and one tooth between them, who directed him to the nymphs, from whom he received winged sandals, a pouch, and the cap of Hades, which, like the Tarnhelm of Teutonic story, made the wearer invisible. Hermes provided him with a semitar, and Athena with a bronze shield, in which as a mirror he could see the face of Medusa without encountering her glance, which turned all living things to stone. After a long journey, which the poets gradually filled with adventures, he reached the distant home of the Gorgons, found them asleep, identified Medusa, cut off her head, and escaped by the aid of his magic helmet. On his return he rescued Andromeda (q.v.), daughter of King Cepheus of Ethiopia (variously localized in this story), and took her with him to Seriphos, where he found his mother and Dictys suppliants at the altar, for Polydectes had resorted to violence. Medusa's head turned Polydectes and his followers to stone, and Perseus sent his magic weapons to the nymphs by Hermes and gave the head to Athena, who placed it on her ægis. Perseus with his wife and mother then returned to Argos and found that Acrisius had fled to Larissa in Thessaly. Perseus followed, and accidentally killed his grandfather while throwing the discus during some games. Returning, he exchanged the rule of Argos for that of Tiryns and later founded Midea and Mycenæ. Perseus is originally the local deity of the spring Perseia by Mycenæ, as Danaë is the ancestor of the Danaans of Argolis. The slaying of Medusa and the rescue of Andromeda were favorite subjects of ancient art and are found on early vases and Pompeian wall paintings as well as in sculpture. They are catalogued and discussed by Knatz, *Quomodo Persei Tabulam Artifices Græci et Romani Tractaverint* (Bonn, 1893). Consult: E. S. Hartland, *The Legend of Perseus: A Study of Tradition in Story, Custom, and Belief* (3 vols., London, 1894-96); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911); and for the story freely told in English, William Morris, "The Doom of King Acrisius," in *The Earthly Paradise* (London, 1868). See PLATE of CELLINI, BENvenuto.

PERSEUS. A northern constellation named

after the hero of Greek mythology. It is situated to the east of Andromeda. Its principal stars are a Persei, or Mirfak (Algenib), of the second magnitude, and the famous variable β Persei, or Algol (q.v.). This constellation has been the scene of the appearance of two *novæ* or temporary stars. (See STAR.) The first of these was detected, long after it had burnt itself out, in 1895 by Mrs. Fleming on plates exposed at the Harvard Observatory in 1887. The other was discovered as a star of the third magnitude on Feb. 22, 1901, by Dr. Anderson, of Edinburgh, and after a brief and spectacular increase of brilliancy faded to its present condition of a faint telescopic star. Near χ Persei is situated the radiant of the swarm of August meteors known as the Perseids. There is a remarkable double cluster about 8° northwest of a Persei.

PERSEUS (c.212 B.C.-?). The last King of Macedonia, the eldest son of Philip V. He was born about 212 B.C. He was from his earliest years trained to a military life, and, having compassed through intrigue the death of his brother Demetrius, who was a favorite both with the Macedonians and with the Romans, and whom he for that reason regarded as a dangerous rival, he ascended the throne on the death of his father in 179 B.C. A struggle with Rome was inevitable, and Perseus was well prepared for it. His treasury and magazines were full, his army amounted to over 40,000 trained men, his alliances were strong, and he was himself popular with his subjects and neighbors. He sought, however, to postpone the inevitable as long as possible, but matters came to an open rupture in 171. In that year the consul Publius Licinius Crassus was sent against him. A blunder of the Romans saved Perseus. Crassus was defeated at Callinicus in Thessaly. But Perseus failed to follow up his victory, and the war was continued without decisive result for a number of years. Finally, in the month of March, 168, Lucius Æmilius Paulus arrived in Greece to take command of the Roman forces, and on June 22 of the same year the Macedonian army was utterly defeated in the battle of Pydna. Perseus fled, but afterward fell with all his treasures into the hands of the Romans. After gracing the triumph of the consul at Rome, he was held in captivity several years at Alba Fucens, in Italy, where he at length died. Consult: Johannes Droysen, *Geschichte des Hellenismus* (2d ed., Gotha, 1877-78); J. P. Mahaffy, *Alexander's Empire* (New York, 1888); E. A. Freeman, *History of Federal Government* (2d ed., New York, 1893).

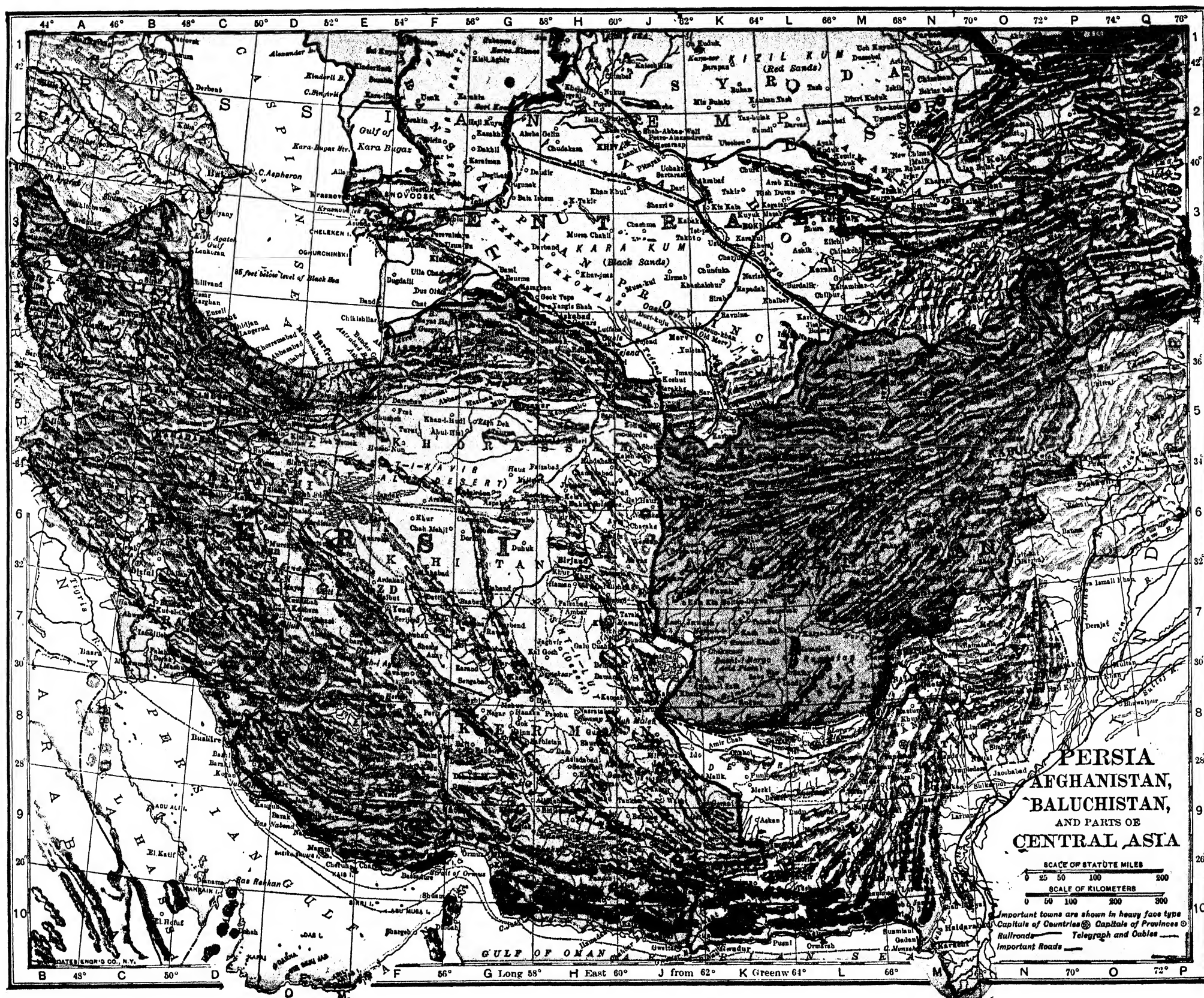
PERSHORE, pēr'shōr. A market town in Worcestershire, England, on the Avon, 7 miles southeast of Worcester (Map: England, D 4). It is noted for the church of the Holy Cross, the only remaining portion of the famous abbey founded in 970. Vegetable and fruit gardening is largely carried on, and there are manufactures of stockings and agricultural machinery. Pop., 1901, 3348; 1911, 4103.

PERSIA, pēr'shā or pēr'zhā (Lat. *Persia*, *Persis*, from Gk. Περσία, from OPers. *Pārsa*, Pers. *Pārs*, Ar. *Fārs*, Persia). A native state, largely under British and Russian spheres of influence, of southwest Asia, called by the inhabitants Iran, the name Persia (Farsistan) being applied only to a small province. It extends from lat. 25° N. (Ras Farsa, near the Baluchistan frontier) almost to lat. 40° N. (Aras River on the border of Transcaucasia) and from long.

44° E. (Armenia) to long. 63° E. (Baluchistan). A line extending northwest and southeast, nearly bisecting the country, is 1400 miles long. Its greatest north and south extent, from Ras el Kuh on the Strait of Ormuz to its most northern point on the frontier of Russian Turkestan, is 875 miles. The country is bounded on the north by Transcaucasia, the Caspian Sea, and Russian Turkestan, on the south by the Indian Ocean and Persian Gulf, on the east by Russian Turkestan, Afghanistan, and Baluchistan, and on the west by Asiatic Turkey and the Persian Gulf. It is over one-fifth as large as the United States, excluding Alaska, having an area of about 628,000 square miles.

Topography. Persia is an elevated tableland, the western half of the great Iranian plateau, from 3000 to 5000 feet in general altitude, sinking to the Caspian Sea and the plain of Turkestan along its northern frontier and to the Persian Gulf and the Mesopotamian plain at its south and west border. To reach the plateau great mountain barriers must be crossed on all sides excepting in the east, where the tableland and mountains merge imperceptibly with those of Afghanistan and Baluchistan. On the other three sides great mountain ranges stretch between the interior plateau and the narrow plains which slope to the Caspian Sea on the north and the Persian Gulf on the south and merge with the plains of Asiatic Turkey on the west. The plain of the Caspian presents a wonderful contrast to the colorless, waterless, and treeless expanse of the plateau to the south, from which it is separated by the Elburz Mountains. It comprises the maritime provinces of Mazanderan and Gilan with a rainfall of 56 inches, so that the mountain slopes are heavily forested, and in the deep alluvial soils brought down by the torrential streams there are dense swamp jungles down to the Caspian, where the salt and sand choke the vegetation. Furthermore, it possesses a degree of atmospheric humidity that is seldom found outside of the tropics. Most of the towns are among the forests on the lower slopes of the mountains. For purposes of agriculture and fruit raising this is the most favored part of Persia. Many large and small plantations have been cleared in the forests, and all the cultivated crops of south Europe, including the mulberry for silk manufacture, attain high perfection. This luxuriance of vegetable life is due to the vapor-charged clouds of the Caspian, which are brought south by the prevailing winds, the northeast trades, and, impinging upon the north slopes of the Elburz, descend in mist and rain to the lowlands.

Along the southern maritime border the mountains, low in elevation and extending east and west, often closely approach the sea, and the narrow plains between them and the ocean, situated in the rain shadow of the northeast trades, are dry and barren excepting in certain districts where the rainfall, supplemented by irrigation, suffices for agriculture. Nearly all the mountains of Persia are bleakly sterile in aspect. The most imposing of the mountain ranges is the Elburz, which, continued eastward by the Kuren Dagh, Kopet Dagh, Ala Dagh, and Binalud Kuh, stretches like a mighty mountain wall along the entire north border. The Elburz, from 10 to 30 miles south of the Caspian, may be crossed by a few passes or defiles, some of them at an elevation of over 8000 feet.



Its upland valleys, with an average elevation of about 4000 feet, are dominated by peaks rising from 8000 to 11,000 feet above the sea, and towering above them all is Demavend, an extinct volcano, 18,600 feet high, the culminating point of Persia. On the flanks of this volcano there are hot springs and fissures which emit steam, but there is neither record nor tradition of its eruption. Its crater, visited by Sven Hedin in 1890, was reported as snow-covered. In the western part of the Elburz is the peak Savalan, 15,792 feet. The wide mountain lands of west Persia extend in many parallel ranges throughout the whole of that part of the country overlooking the valley of the Tigris and the Persian Gulf. Their trend is from northwest to southeast. They form the mountain barrier between Persia and Turkey and are known as the Zagros Mountains in the north and the Pushti Kuh in the south. Some of the peaks are snow-crowned most of the year, and Mount Alijuk, south of Ispahan, is 14,000 feet in elevation. But the highest continuous range of these highlands is the Kuh Dinar, extending north of Shiraz, whose highest summit, the Kuh i Dena, is over 14,000 feet in elevation. Islands along the east coast of the Persian Gulf are merely the partly submerged fragments of the coast ranges.

The table-land of the interior, thus walled in by mountains, is itself intersected by numerous ranges and detached masses of mountains, excepting in eastern Persia, where great plains and deserts are the main topographic feature. Between these ranges, also extending northwest and southeast, are wide plains and narrow valleys. These plains and valleys would be utterly sterile were it not for the mountains near them, which fortunately receive most of the precipitation in the winter in the form of snow which is easily stored against the summer. The valleys are more easily irrigated and are thus more fertile than the plains, which are here and there brightened by a patch of green oasis, but for the most part are sandy and barren. The general aspect of the plateau is that of a cheerless and monotonous waste stretching to the base of mountains that are equally bleak and uninviting and reaching the acme of desolation in the two deserts of the east, the Dasht i Kavir or Great Salt Desert, extending between lat. 33° and 36° N. and from long. 52° to 57° E., and the more southerly Dasht i Lut or Great Sand Desert, extending between lat. 29° and 32° N. and between long. 57° and 60° E. Their combined length is over 500 miles from northwest to southeast, but they are separated between the thirty-second and thirty-fourth parallels by a hilly region through which passes one of the main caravan routes between central Persia and Meshhed in the northern mountains. The origin of the Great Salt Desert is not yet clearly determined. One theory is that it is due to the drainage of intermittent saline streams from the surrounding higher lands and the consequent deposition of a white crust or efflorescence; the other theory is that it is the bed of an ancient salt lake. Geologists now incline to the latter explanation. In 1891 a solid bed of rock salt estimated at over 600 square miles in area and several feet in thickness was discovered in this remarkable region. Lieutenant Vaughn and C. E. Biddulph, who brought to light this sea of solid rock salt, which is probably unrivaled in the world, found it so hard that with

iron tent pegs they were able to detach only a few chips.

The Dasht i Lut or Great Sand Desert, which separates the Province of Khorassan from that of Kirman, has salt also as one of its chief ingredients, but it is rarely overlaid like the more northern desert with saline incrustations or briny swamps. It gives life to a few poor shrubs, while nothing grows in the other desert. Sand is its prevailing feature. It is much lower in altitude than the Great Salt Desert, its average elevation being less than 2000 feet, while in places it sinks to only 500 feet above sea level. All these topographic aspects have a marked effect upon the distribution of the population. The lines of villages and cities follow the trend of the mountains from east to west across north Persia and from northwest to southeast across west and central Persia, because only in the neighborhood of the mountains can water be obtained to supply the towns and nourish the gardens and fields. Where the ranges spread far apart and in east Persia, where there are few high elevations, there is only a sprinkling of human inhabitants. Desolation reigns over vast expanses.

Hydrography. The waters of four-fifths of Persia do not reach the ocean, but are lost in inland seas, swamps, or lakes or disappear in the sands. Few rivers are worthy of special mention. Among them is the Karun, which drains a large part of the mountainous provinces of Luristan and Khuzistan, empties into the Persian Gulf, and is nearly 4 feet deep throughout the year. A small steamer, subsidized by the British government, is now making regular trips 150 miles up the river to Ahwaz, where rapids and ledges obstruct navigation. No other river is navigable. The Sefid Rud, Atrek, and Gurgan, draining the northern slopes of the Elburz and its prolongations, are the only considerable streams entering the Caspian. The streams flowing to the inland basins are much inferior in volume to those emptying into the sea. The Helmand, the upper part in Afghanistan, forms just east of the Great Sand Desert the Lake of Seistan, surrounded by great swampy tracts covered with wiry grass or great reeds. Only two other lakes are of importance. Lake Urumiah lies in the extreme northwest, and from its surface the snowy top of Mount Ararat may be seen. It is heavily charged with salt. Its wooded shores and islets give a pleasing impression, but the average depth is only about 15 feet, and, though it covers an area of about 1600 square miles, its volume is six or seven times inferior to that of Lake Geneva in Switzerland. The great salt lake of south Persia is Niriz, much smaller than Urumiah and with a greatly indented and fantastic outline.

Climate. The winter cold is intense on the high table-land. The summers are very warm, but there is little humidity, and the dry, clear heat is easier to bear than that of north India. On the other hand, the air is damp and relaxing in the forest-covered lowlands of the Caspian, and the southern maritime tracts are very dry and hot at most seasons. Spring and autumn are the most enjoyable parts of the year. The average annual rainfall perhaps does not exceed 10 inches in any part of the country excepting along the Caspian, where the lowland Caspian provinces have a rainfall about five times greater than that of the highlands. The soils, composed of a mixture of sandstone,

limestone, and volcanic debris washed down from the mountain slopes, are very productive.

Flora. As Persia is a land of transition between eastern Asia and the Western World, its flora partakes of the character of the surrounding lands. The zones of vegetation succeed one another quite abruptly. Polar species, e.g., are found on the higher summits of the north, while wheat is cultivated at heights of 9000 feet, and rice and the fruits of southern Europe thrive on the neighboring lowlands. Except on the Caspian seaboard, the Persian flora is poor in varieties. Over most of the plateau the konar tree, cyprus, dwarf oak, walnut, and mulberry are almost the only timber encountered. But the rich humid valleys of the Caspian belt and the lower slopes of the Elburz produce timbers of great variety, including the oak, ash, beech, elm, alder, birch, sycamore, cherry, and thorn. In the same region the fruits of Europe and of Asia meet and are grown in great variety. Among the medicinal products are gum tragacanth, gum arabic, asafoetida, and several others; indigo, henna, madder root, saffron, gallnuts, and other dyestuffs are also valuable products. The rose is preëminent among flowers, and attar of roses is among the famous productions.

Fauna. The animals of Persia differ little from those of the neighboring lands. In the forests of the Caspian plain are the hare, fox, wolf, hyena, jackal, leopard, tiger, lynx, and wild boar. On the mountains are seen the ibex, mountain sheep, wild goat, antelope, and bear. The maneless lion sometimes attacks human beings, but preys chiefly on the wild boar. Although the Persian fauna is poor in number of species, the reptiles, especially lizards, are represented by many varieties. Owing to the general aridity of the land, snails and other land mollusks are nowhere found. The domestic animals include fine horses and mules, single-hump camels, sheep of the fat-tailed species yielding a fine quality of wool, dogs, and several species of falcons that are trained for the chase. In the Seistan region great flocks of ducks and geese may be found. Pelicans, swans, and snipe are also common.

Geology and Mineral Resources. Most of the table-land and mountains are of sedimentary formation, largely sandstone, Tertiary limestone, chalks, and Cretaceous nummulitic rocks. But interspersed among these sedimentary rocks are mountains built up of eruptive rocks and volcanic ash such as Mounts Demavend, Savalan, and many others. The deserts are composed mainly of saline and sand accumulations. The mineral resources are enormous, but are largely undeveloped. Roughly speaking, there are six mineral-producing zones: (1) the Province of Azerbaijan, in the northwest, where tin, iron, copper, lead, and coal are found; (2) the north and south slopes of the main Elburz Range, where iron and coal occur near each other, Teheran deriving its coal supply from this region; (3) Khorassan, the rich northeastern province, which contains the famous turquoise mines of Nishapur, which have been worked from an early age and in which are obtained considerable quantities of copper, coal, and salt; (4) the Province of Kirman, with copper, lead, borax, manganese ore, and fine marble; (5) the highly mineralized districts in the central mountains, with iron, antimony, nickel, cobalt, copper, lead, sulphur, and asbestos; and (6) the Persian

Gulf littoral, with naphtha, rock salt, iron, ochre, gypsum, nitrates, and sulphur. While Persia abounds in remarkable mineral resources, their commercial value is chiefly dependent on the cost of transportation to the coast or nearest markets. In the absence of good roads the minerals of large parts of Persia must long remain almost untouched. The total revenues to the government under the head of royalties and rents from mines are less than \$80,000 per year.

Agriculture. Tillage in Persia depends upon the water supply. The detritus swept down by the streams or torrents deposits a layer of soil upon the sand, which is subsequently fertilized by the same agency that brought it. A large amount of cultivable land is not yet utilized. Cereals, chiefly wheat, barley, and rice, are grown throughout the country. Also generally produced are peas, beans, lentils, grain, and millet. Sugar cane is sparsely cultivated, and coarse sugar is made, but large imports from Russia and France are necessary. Cotton, short in staple, thrives to an elevation of 5000 feet above the sea, and over 100,000 bales are annually exported to the mills of Bombay and Marseilles. Silk is produced in the Caspian provinces to the amount of 500,000 pounds a year, most of it going to Yezd, Kashan, and Ispahan, the centres of the manufacturing trade; and large quantities of cocoons are sent to Europe. Persian tobacco is known throughout western Asia for its superior quality. The home consumption is enormous, and the exports to other Asiatic countries and Egypt though large are smaller than formerly. The production is roughly estimated at over 50,000 tons a year. The poppy has been widely cultivated since 1864, chiefly in the central and southern provinces, with an average production of over 6000 chests of opium. The purest quality is sent to London for the extraction of morphine and is in part reexported to America. Indigo grown in the southwest is used in the dyeing of cotton. Nearly every house has its vegetable and tangled but beautiful flower garden. The fruits include the grape, plum, raspberry, apple, pear, peach, and apricot; and Persia is said to produce the finest melons in the world. Dates are grown along the Persian Gulf and are sold abroad. The implements of tillage are extremely primitive.

Live stock is not so great a source of wealth as formerly, and exports have declined. The sturdy Persian horse is excellent for cavalry or ordinary purposes, and the mule, though small, has extraordinary strength and endurance. The best camels of Khorassan carry 600 pounds at the rate of 20 miles a day. Skins and hides are exported to Bagdad and Russia. Persian lamb skins are famous. Sheep's wool is exported and is also used in the domestic manufacture of cloths and shawls. The shores of the Caspian and the rivers emptying into it are richly stocked with fish.

Manufactures. The chief manufactures are silk, woolen, and cotton tissues and artistic fabrications. Broadly speaking, there are no factories, the output being the work of private shops or the production of special, localized schools of industry. Almost every large town has its own special manufactures which cannot be procured elsewhere. The most important and best known of the textile fabrics is Persian carpet, of which there are about 30 different kinds, all hand-made and the design varying with each

carpet. Each kind has its own characteristics, so that it is easy to distinguish between the products of different districts. Carpets are sent to Europe and America. The woolen shawls of Kirman made of goats' hair are also famous. Cotton fabrics, chintzes, velvets, silks, and embroideries are produced in considerable quantity, though the cheaper fabrics of European looms have injured all the home textile industries including that of carpets. For illustration, see Colored Plate under Rugs.

The earthenware and falience of old Persia were its most famous artistic products. The ceramic arts, however, have now largely disappeared. Enameling in gold, silver, and copper is the best surviving relic of the ancient metal work. Native artisans still excel in copper, glass, and filigree work, and carvings. The lack of good means of transportation, the neglect of the government, the apathy of the people, and the invasion of foreign products are responsible for the undoubted decline of Persia in the manufacturing arts.

Commerce. The Russian frontier is within 80 miles of Tabriz, the commercial capital of Persia, and Russian steamers unload cargoes within 160 miles of Teheran. The result is that in northern Persia Russia is the predominant commercial factor. In southern Persia Great Britain, controlling the Persian Gulf, has been able, since the opening of the Suez Canal, firmly to establish its supremacy in trade. The great inland centres of commerce are Tabriz, Teheran, Ispahan, and Meshhed, connected by caravan routes to which smaller routes extending to most parts of the country are tributary. The imports are determined by the fact that the country is deficient in many products which constitute the necessities of civilized life. Iron is worked only in the rudest fashion, little sugar is made, domestic fabrics are in limited supply, and yet Persia consumes enormous quantities of sugar, hardware, textiles, and many other manufactures. Cotton textiles are the largest imports. Great Britain supplies most of the bleached and unbleached cottons. Reported imports and exports in the year 1910-11, 484,508,000 and 375,427,000 krans respectively (the kran is worth about 9 cents); in 1912-13, 567,576,000 and 436,333,000. Values of the leading imports and exports as reported for the latter year are shown below, in thousands of krans:

IMPORTS	1000 kr.	Exports	1000 kr.
Cotton goods	186,190	Cotton	93,843
Sugar....	138,978	Fruits	47,457
Tea....	40,978	Rice	42,309
Flour....	22,475	Opium	34,916
Yarn....	13,580	Spices	27,428
Woolen goods	15,815	Gums	13,902
Gold....	11,558	Skins	12,675
Petroleum	10,841	Cocoons	11,788
Haberdashery	10,100	Hides	11,359

Imports from and exports to Russia in 1912-13, 328,980 and 300,878 thousand krans respectively; United Kingdom, 86,382 and 34,328; British India, 66,799 and 22,270; Turkey, 23,389 and 37,927; Germany, 21,388 and 2928; France, 11,031 and 4829.

The principal ports are Bushire, Bender Abbas, and Linga, on the Persian Gulf, and Enzeli and Meshhed i Ser (the port of Balfarush) on the Caspian. Trebizond, a port of Asiatic Turkey

on the Black Sea, is still an important outlet for the trade of Tabriz. In February, 1903, the new tariff agreement between Russia and Persia, by which the ad valorem duties of 5 per cent on both exports and imports were changed to a specific tariff, went into effect. All the other foreign Powers are included in this agreement on the "most favored nation" basis.

Transportation and Communication. The roads are very poor, the caravan routes being merely mule paths. An excellent highway 217 miles long, extending from Resht on the Caspian Sea to Teheran, built by the Russian government, was completed in 1899. Another improved road built by British capital was completed in 1900 between Ispahan and Ahwaz, the head of navigation on the Karun River. Regular steamship lines connect the ports of the Caspian Sea with Russian ports, and the ports of the Persian Gulf with Great Britain and India. The only railroad extends from Teheran to one of the suburbs—6 miles. The telegraph system extends north and south across the country and east and west across northern Persia, with about 6500 miles of line. There are reported 218 post offices.

Banking. The Imperial Bank of Persia, established in 1889 under a concession granted to Baron Reuter, has an authorized capital of £4,000,000 sterling, which, however, has been considerably reduced owing to the fall in silver. The bank has the exclusive right to issue notes, which must not exceed £800,000 unless authorized by the Persian government. The issue of notes is on the basis of the silver kran, the coin in reserve now being 33 per cent. The head office is at Teheran, and there are branches at Tabriz, Resht, Meshhed, Ispahan, Yezd, Shiraz, Bushire, and Bombay. The Russian Banque d'Escompte, which is connected with the Russian State Bank, is also established in Teheran.

Government. The government till late in 1906 was an absolute monarchy in the hands of the Shah. In that year a national council (Mejliss) was introduced. (See *History*, below.) The Shah is assisted by a ministry consisting of a premier and of ministers of Foreign Affairs, Interior, Finance, War, Education, Posts and Telegraphs, Justice, and Commerce. The rule of the Shah is restrained in that it must accord with the "divine law" of the Mohammedan religion. Furthermore, the Imâm-Juma, not the Shah, stands at the head of the Shiah religious system, which prevails in Persia. The country is divided into provinces of varying size and importance, administered by governors-general directly responsible to the central government. The provinces are divided into subprovinces, districts, subdistricts, parishes, cities, towns, and villages. These minor divisions are administered by lieutenant governors, mayors, etc., who are appointed by the Governor and are directly responsible to him. Justice is administered both by the Shah and by the clergy, according to the laws of the Koran, and is often satisfied, even in connection with the worst crimes, by payment of money to the government. The Persians, however, have been notorious for the cruelty of their punishments and their disregard of human life. Teheran is the capital.

Finance. The revenues and business of the country suffer from the great fluctuation in value of the silver medium of exchange. Owing to

the rise in the price of silver, the value of the revenue rose in 1890-91 to £1,775,000, but the subsequent decline in the price of silver reduced the value of the revenue for 1904-05 (estimated at about £1,450,000); for 1913-14 the revenue amounted to £1,480,778. The revenue is derived from assessments upon towns, villages, and districts, and from the customs, post office, telegraphs, fisheries, mines, and some other concessions. Expenditure for 1911-12 was reported at £1,608,600. Public debt: Russian loan of 1900, 22,500,000 rubles; Russian loan of 1902, 10,000,000 rubles; British loan of 1911, £1,250,000 (these three loans at 5 per cent); floating debt, 104,870,000 krans; annuities, 14,000,000 krans.

Weights, Measures, and Money. The kran, a silver coin, is the monetary unit. Its value, subject to great fluctuations, is about 9 cents. The copper coinage has been entirely replaced by large quantities of nickel 5 and 10 centime pieces coined at Brussels and put into circulation in 1900. There are six gold coins—the toman (nominally 10 krans) and subdivisions and multiples thereof. Very little gold is in circulation. The unit of weight is the miskal (71 grains), but most articles are bought and sold by a weight called batman or man, which varies in avoirdupois, one of the most commonly used being the man-i-Tabriz, which equals 640 miskals or 6.49 pounds. The unit of measure in Persia is the zar or gez, of which several standards are in use, the most common measuring 40.95 inches.

Population. The inhabitants are estimated to number about 9,500,000, the largest part of whom live in the cities and towns. Large areas are uninhabited. The estimated population of the principal cities is: Teheran, 280,000; Tabriz, 200,000; Ispahan, 80,000; Meshhed, 60,000; Kirman, about 60,000; Yezd, 45,000; Balfrush and Shiraz, 50,000 each. The inhabitants are divided into two distinct classes, the dwellers in towns or villages and the dwellers in tents. Many of the richer dwellers in the towns leave for the mountains during the hot summer months. The nomads, which include Arabs (260,000), Kurds (675,000), Turks (720,000), Luris (234,000), and Baluchis and Gypsies (20,700), move from place to place according as their animals need pasturage or their other interests dictate.

Religion. Upwards of 90 per cent of the people belong to the Shiite sect of Islam. Some 800,000, principally Kurds in the northwest, are Sunnites. Wide tolerance is exercised towards the followers of other religions in places where Europeans reside, but elsewhere they are sometimes oppressed by the lower classes of the population. It is supposed that Christians in Persia number about 80,000, Jews, 36,000, and Parsis, 9000.

Education. All wealthy families employ private tutors for their children, and many colleges supported at public expense instruct students in religion, Persian and Arabic literature, and some scientific branches. There are also many schools for children, but most of the instruction is limited to the reading of the Koran. Western languages and science have been introduced to some extent into Persia by the polytechnic school which was opened in Teheran in 1849. It has several European professors. There are military colleges at Teheran and Tabriz, and a number of schools with improved methods of

teaching supported by subscription and small tuition fees are in several of the larger towns.

Army. Owing to an irregular and inefficient military system the recruitment by territorial district, province, and tribe is usually less than that anticipated. From time to time attempts have been made to utilize the services of trained European officers, especially Russian and Swedish, but these attempts have so far met with little success. The theory of military liability includes a contingent of one or more battalions from districts, provinces, and tribes. Christians and Jews pay a military tax, but do not serve in the army. The land forces, on paper, consist of (1) a regular army (*nizam*) of 79 battalions of infantry, 23 batteries of field artillery, a battalion of engineers, and a Cossack brigade, under Russian officers, stationed at the capital—in all, about 50,000 men; (2) an irregular force, poorly armed, mostly cavalry, about 50,000 men; (3) a military police, under 36 Swedish and 120 native officers, consisting of about 6000 men, of whom about 2000 are mounted. This police force is armed with Mauser rifles and machine guns and has a battery of mountain guns attached. It covers the roads connecting the principal cities and towns, with headquarters at Teheran, Kazrin, and Hamadan. See ARMIES.

Ethnology. The Persians, ancient and modern, are the most numerous and the most important historically of the Iranian group of Aryan peoples. The great plateau of Iran has been occupied since the earliest historical times by peoples of Aryan stock, Medes, proto-Medes, and ancient Persians, who played a great rôle in the development of western Asia, produced monuments of lasting grandeur, imposed a court and a language upon nations from the Mediterranean to the Bay of Bengal, and through their literature profoundly influenced both the Orient and the Occident. They are also said to have had more or less to do with the rise of strict monotheism among the Hebrews after the captivity. The culture of the modern Persians covers a wide range, from the civilization or semicivilization of the cities and towns to the nomadism and pastoralism of a very primitive sort prevalent in the mountainous districts. The civilization of the Persians is often spoken of as only "skin-deep," the barbarian and the savage sleeping but lightly in the garb of culture. Physically the mass of the Persians belong to the Aryan type, although much intermixture (as the modern Persian type shows) has taken place. The pure Iranian is to be found among the Farsis about Persepolis, and among the Loris (Luris) or mountaineers, somewhat farther to the west. Of the "ideal Persian type" there are three subvarieties: 1. A darker population towards the southwest, along the line of contact with the Arabs; a Semitic strain pointing towards Africa. 2. The great mass of the Persian population—the Hajemis and Tajiks of the east and northeast—the result of a Turkoman-Tatar cross with the pure Iranian. Here belong also the Azerbaijani Tatars, Turkish in speech, but distinctly Iranian in race. 3. The Susians about the mouth of the Persian Gulf in the southeast, where a strain of Negroid blood is apparent and relationship with the hill tribes of India is suggested. Some authorities, however, do not attribute so much importance to the Negroid traits of the Susians, since they may be due to slave intermixture. With the

Hajemis, whose habitat is chiefly between Teheran and Ispahan, belong the Talych, Mazanderani, and other tribes of the Caspian littoral, to whom are closely related, both dialectically and otherwise, the Tat and Guran of the extreme west, who are agriculturists. The Tajiks are the settled agricultural population of the greater part of Persia, as well as the stock from which many of its mercantile classes come. The same name is applied to their kindred between the Caspian, China, and India. The Tajiks are brachycephalic and above the average in height, while the Hajemis and in part the Farsis are dolichocephalic and of average stature. The Persians of the Persepolitan country are fair-skinned, slender, finely formed, and blonds by comparison with their darker neighbors. The Loris or Luris are taller, much darker, and dolichocephalic. Besides its Aryan population Persia contains a considerable number of Turks and some few Arabs. In the extreme west Kurds (Aryans) are also to be found; likewise some Armenians, also Aryans. See *PLATE OF ASIA, YELLOW RACES OF*.

History. Although the legendary history of Persia begins some thousands of years before the Christian era, our earliest trustworthy information is derived from the Greek writers. Herodotus, Ctesias, and Xenophon are our chief authorities, but their accounts are very conflicting. The northwestern part of Iran, anciently called Media (q.v.), was, when it was first known to the Greeks, a part of the Assyrian Empire; but the Medes revolted and under Deioces established an empire which subdued both Assyria and their own kindred Persia. Herodotus states that the Persians were brought under complete subjection, but Xenophon's account implies that they were entirely independent, or at most that they recognized only a nominal allegiance to the ruling power.

The history of the Persian Empire proper begins with the revolt under Cyrus the Great about the middle of the sixth century B.C. With the defeat of Astyages, King of the Medes, the Persians gained their independence and subdued their former masters, who from this time became amalgamated with them. Cyrus continued his career of conquest and soon succeeded in establishing a mighty empire, which extended from the Oxus and Indus to the shores of the Mediterranean. (See *CYRUS THE GREAT*.) His son, Cambyses II, a cruel tyrant (529-522 B.C.), subdued Tyre, Cyprus, and Egypt. After the brief rule of the usurper Smerdis (522-521), Darius I, surnamed Hystaspis (521-486), mounted the throne. He firmly established his dynasty, added Thrace and Macedonia to his empire, and suppressed a revolt of the Greek cities of Ionia; but his two attempts to subdue Greece were completely foiled—the first by the Thracians, and the second by the Athenians at Marathon (490). One important service which he performed for the Empire was the organization of the satrap system of administration. The whole Empire was divided into provinces, and over each was placed a governor, or satrap, who was directly responsible to the Great King. Some uniformity in the government was thus secured, and the Empire, as a whole, was very much strengthened. Darius' son, Xerxes I (486-466), raised the largest army that the world had ever seen for the subjugation of Greece. His military force was seconded by a great fleet. The King himself led the expedition in 480. He at

first advanced successfully, but his fleet was utterly defeated at Salamis, and in 479 his army was overwhelmed at Plataea, while his fleet sustained another great defeat at Mycale, on the coast of Asia Minor. He was now forced to act on the defensive and thereby, despite his energy, exhausted the resources of his kingdom. (See *GREECE, Ancient History*.) His son, Artaxerxes I (466-425), surnamed Longimanus, was unable to stay the decadence of Persia, which had now commenced. He, however, crushed a formidable rebellion in Egypt, though his wars with the Greeks and the Ionians were unsuccessful. The Empire became racked by internal strife, which continued during the reigns of his successors, Xerxes II Sogdianus, Darius II, Artaxerxes II, and Artaxerxes III. Darius III Codomannus (336-330), the last of the dynasty, was compelled to yield his throne to Alexander the Great (q.v.), who conquered all the former provinces of Persia and founded a vast empire, which after his death, in 323, was divided into four parts, Persia along with Syria passing to the Seleucidæ (q.v.), and its old dependency, Egypt, to the Ptolemies.

The Seleucidæ soon lost Bactria, which became independent under a series of Greek sovereigns; and about 246 B.C. Parthia (q.v.) also rebelled under Arsaces I, who founded the dynasty of the Arsacidæ (q.v.), by whom the greater part of Persia was wrested from the Greeks and defended alike against the Greeks and the Romans. The Greek Empire of Bactria, which included part of north Hindustan, was overthrown by nomads from Turkestan. The Parthians drove these invaders out and added Bactria to their Empire. The dynasty of the Arsacidæ was brought to an end about 226 A.D. by a Persian named Ardashir (q.v.), the founder of the dynasty of the Sassanidæ (q.v.).

The Sassanian kings raised Persia to a great height of power and prosperity and more than once imperiled the Byzantine Empire. The greatest of these monarchs were Shapur (Sapor, Shahpuhr) I (241-272), the patron of the heresiarch Mani (q.v.); Shapur II (310-379), the opponent of Constantius and Julian and a bitter foe of the Christians; Khosru (Chosroes) I Nushirvan (531-579); and Khosru II Parviz (590-628). Soon after the death of Khosru II the Persian monarchy was engulfed in the tide of Saracen conquest. The victories of Cadesia (c.636) and of Nehavend (c.642) made the Arabs masters of the Kingdom. During the reigns of Omar (the first of the Arab rulers of Persia), Othman, Ali, and the Omniads (to 750), Persia was ruled by deputy governors; but on the accession of the Abbassides (750) Bagdad became their capital and Khorassan their favorite province, and Persia consequently was regarded as the centre of the caliphate. But their rule soon became a nominal one, and ambitious governors established independent principalities in various parts of the country. Many of these dynasties were short-lived, but others lasted for a considerable period and represented powerful empires. The chief in west Persia were the Tahirites (820-873) in Khorassan; the Saffarides (c.867-900) in Seistan, Fars, and Kerman; their successors, the Samani (q.v.) (900-1229), who became the rulers of Transoxiana, Khorassan, and Seistan; the Ziyarides (928-1042)—Kabus, the hero of the *Kabus Namah*, was one of them—in Tabaristan and Isfahan; and the shahs of Dilem, Buy-

ides or Buwayhides (932-1035). In east Persia the Ghaznevides (q.v.) (962-1186) carried their conquests to India under the famous Mahmud (1005-30). This period (end of the tenth and beginning of the eleventh centuries) was illustrated by the great names of Firdausi, Biruni, and Avicenna (q.v.). See PERSIAN LITERATURE.

This series of dynasties was ended by the Seljuks (q.v.), whose dominion extended from the Hellespont to Afghanistan. The unity of their empire was, however, soon destroyed. The sultans of Khwarezm, e.g., gradually acquired the greater part of Persia, driving out the Ghaznevides and their successors the Ghurides (see GHURI; KHIVA); but, together with the petty dynasties which had established themselves in the southwestern provinces, they were swept away by the Mongols under Genghis Khan (q.v.) and his grandson Hulagu Khan, the latter the founder of a new dynasty, the Perso-Mongol or Ilkhan (1251-1335). It was followed by several petty dynasties of Ilkhans, i.e., provincial khans as distinguished from the sovereign Khan, or Khakan, of China. Persia was freed from their misrule by Timur (q.v.), one of the world's greatest conquerors. Shortly after the death of Timur's son and successor, Shah Rukh (died 1447), the Turkomans, led by Uzun Hasan, took possession of the western part of the country, while the eastern portion was divided among Timur's descendants, until at the close of the fifteenth century the Uzbeks (q.v.) added all eastern Persia to their new Khannate of Khiva.

In 1500 a new dynasty arose in western Persia. Ismail, the first Prince of this line, became the leader of a number of Turkish tribes, overthrew the Turkomans and seized Azerbaijan, which was the seat of their power. He quickly subdued the western provinces and in 1511 took Khorassan and Balkh from the Uzbeks, but in 1514 he had to encounter a much more formidable enemy in Selim I (q.v.), the Sultan of Turkey. The Persians were totally defeated in a battle on the frontiers, but after his retreat Ismail attacked and subdued Georgia. His son Tamasp (1523-76), a prudent and spirited ruler, repeatedly drove out the Uzbeks from Khorassan, defeated the Turks, and assisted Humayun, the son of Baber, to regain the throne of Delhi. After a period of upheaval, during which the Turks and Uzbeks attacked the Empire, Shah Abbas I the Great (1585-1628) ascended the throne, restored tranquillity, and repelled the invaders. In 1605 he inflicted on the Turks a defeat which enabled him to recover the whole of Kurdistan, Mosul, and Diarbekir, which had for a long time been separated from Persia; while in the east Kandahar was taken from the Great Mogul. The government of Abbas was strict but just. He constructed at immense expense roads, bridges, caravansaries, and other conveniences for trade, and, with a tolerance unusual in a Mohammedan, he encouraged the Armenian Christians to settle in the country, knowing that their industry would help to advance the prosperity of his kingdom. His successors, Shah Sufi (1628-41), Shah Abbas II (1641-66), and Shah Sulaiman (1666-94), were undistinguished by any remarkable talents, although the two former were sensible and judicious rulers and advanced the prosperity of their subjects. During the reign of Sultan Hussein (1694-1722) priests and slaves were elevated to the most important offices of the

Empire and religious persecution ran riot. The consequence was a general discontent, of which the Afghans took advantage by declaring their independence and seizing Kandahar (1709). Their leader, Mir Vais, died in 1715, but one of his successors, Mahmud, invaded Persia (1722), defeated Hussein's armies, and besieged the Sultan in Ispahan. Hussein then abdicated the throne in favor of Mahmud, who on his accession immediately devoted his energies to gaining the confidence of his new subjects. He became insane and was deposed in 1725 by his brother Ashraf (1725-29), but the latter's tyranny was ended by Nadir Shah (q.v.), who raised first Tamasp (1729-32), and then his son, Abbas II (1732-36), of the Sefavid race, to the throne. Not content with the nominal rule, Nadir Shah found a pretext to depose Abbas and seized the sceptre (1736-47). On his death anarchy reigned; the country was devastated by the rival claimants for the throne; Afghanistan and Baluchistan finally separated from Persia, and the country was divided into a number of small independent states till 1755, when a Kurd named Kerimkhan (1755-79) reestablished unity in western Persia and by his wisdom, justice, and valor gained the esteem of his subjects and the respect of neighboring states. After a period of anarchy Lutf Ali ascended the throne in 1780, but was attacked by Agha Mohammed, a eunuch of the Kadgar race, who had set up an independent principality in Mazanderan. Agha Mohammed triumphed in 1795, becoming the founder of the present dynasty. On his accession he announced his intention of regaining what had been lost since the reign of Kerimkhan and accordingly invaded Khorassan and Georgia, subduing the former country almost without effort. The Georgians, however, besought the aid of Russia, but Agha Mohammed at once marched his army into the country and devastated it with fire and sword; his conquest was, however, hardly completed when he was assassinated, May 14, 1797. His nephew, Futteh Ali (1797-1834), succeeded him and after a period of conflict succeeded in fully establishing his authority. He completely subdued the rebellious tribes in Khorassan, but was involved in a war with Russia soon after his accession and by a treaty concluded in 1797 was forced to surrender Derbend and several districts on the Kur.

In 1801 Georgia was declared to be a Russian province. War with Russia was recommenced by Persia at the instigation of France, and after two years of disaster Futteh Ali by the Treaty of Gulistan (Oct. 12, 1813) ceded to Russia Daghestan, Shirvan, Baku, etc., and granted her the right of navigation in the Caspian Sea. In 1826 a third Russian war broke out, equally unfortunate for Persia, which in the Treaty of Turkmanchai (1828) had to surrender the bulk of Persian Armenia and pay a war indemnity of 18,000,000 rubles. The severe taxation necessary to pay this sum so exasperated the people that they rose in insurrection (Oct. 12, 1829) and murdered the Russian Ambassador, his wife, and almost all the Russian Legation. The most humiliating concessions and the mutilation of 1500 of the rioters alone averted war. The death of the Crown Prince, Abbas Mirza, in 1833, seemed to give the final blow to the declining fortunes of Persia, for he was the only man who seriously attempted to raise his country from its abasement. By the

assistance of Russia and Great Britain Mohammed Shah (1834-48), the son of Abbas Mirza, obtained the crown. He resolved to extend the Persian dominions to the Afghan, Baluch, and Khivan boundaries, but an attempt which he made to reannex Herat was resisted by England. The war was terminated in 1838 by the landing of a small Sepoy force on the shores of the Persian Gulf.

Nasr ed Din succeeded to the throne on his father's death in 1848, and the new government announced energetic reforms, but failed completely in carrying them out. Following his father's example, the new Shah resolved to reassert his claims in Afghanistan and Baluchistan. The ruler of Herat having recognized the claims of Persia, the English government remonstrated with the Shah, and he was compelled to sign an agreement on Jan 25, 1853, by which he bound himself not to interfere further in the internal affairs of Herat. In October, 1856, however, on the pretext that Dost Mohammed, the Ameer of Kabul, was about to invade Herat, the Persians again took the city of Herat. In consequence of this violation of the terms of the treaty with Great Britain, war was declared against Persia, and a British army was landed on the coast of the Persian Gulf, which, under Generals Outram and Havelock, repeatedly defeated the Persians and compelled them to restore Herat (July, 1857). In 1868 the Persians occupied Seistan, a province claimed by the Afghans, and extended their jurisdiction over the western third of Baluchistan. To put an end to this incessant strife, the Persians at length agreed with the Ameer of Afghanistan and the Khan of Khelat to refer the questions in dispute to an English commissioner. Sir Frederick Goldsmid accordingly visited the eastern frontier of Persia and in 1872 delivered his award. It carried the Baluch frontier from long. 58° to 63° E., so as to include in Persia the inland town of Jalk, and Guadar on the Indian Ocean. In 1870 the Russians granted the extension of the jurisdiction of Persia over the whole basin of the Atrek. In 1873 Nasr ed Din visited several of the European courts, in 1878 he visited Russia, and in 1889 he again made a tour of Europe. As a ruler he was energetic and severe. His policy was largely under the influence of the Russian court, though for a time, after the failure of his attempt to restore the Persian dominion over Herat, he maintained a somewhat friendly attitude towards Great Britain. He sternly repressed revolts and conspiracies, but, through the sale of the tobacco monopoly to English speculators, he offended many of his subjects, and his unpopularity was increased by the scarcity of food in several of the provinces in subsequent years. In 1896 a mullah, an adherent of a seditious sect, who had been banished from Persia in 1891, shot and killed the Shah while the latter was entering a shrine near Teheran. His son, Muzaffar ed Din, was proclaimed Shah in the following month. He died in 1907 and was succeeded by his eldest son, Mohammed Ali Mirza.

The two outstanding events in the history of Persia during the twentieth century were the establishment of parliamentary government and the economic partition of the country by Great Britain and Russia. In 1906 there was so much dissatisfaction with the corruption and incompetence of the government that over 15,000

people, mainly merchants, left Teheran, declaring that they would not return unless the Shah granted a constitution. The Shah yielded and issued a call for a national *Mejlis*, or Parliament, to be chosen by the princes, clergy, Kadgars (the royal tribe), nobles, and merchants. This body assembled in Teheran on Oct. 7, 1906, under the presidency of Sanieh ed Dowleh. Shortly afterward the Shah abdicated, and the Crown Prince, Mohammed Ali, governed as Regent; on the death of his father he was crowned Shah.

The new constitution of Persia gave to Parliament the control of the finances of the Kingdom. This was a most important provision, especially so for Persia, because the foreign nations could no longer control the country by giving money to the Shah, who was inclined to be a spendthrift. For this reason the latter was bitterly opposed to Parliament. Quarrels soon arose between the Shah and Parliament concerning the latter's powers. A powerful party appeared, composed of the mullahs or priests who favored absolute government by the Shah on the ground that a parliamentary régime violated the ancient customs and religion of the Persian people. Riots took place between the Absolutists and the Constitutionalists or Nationalists, which brought the country to a state of anarchy and civil war. In 1909 the Shah executed a coup d'état. The cabinet was forced to resign, and the Prime Minister was exiled. Martial law was proclaimed, and Parliament was dissolved by a body of Cossacks sent by Russia to aid the Shah, as the Persian army remained loyal to Parliament. This was followed by a civil war in which the Nationalists were generally successful. Ispahan, Tabriz, and the entire northern part of the Kingdom fell into their hands. The capital, Teheran, was finally captured, and the Shah fled for safety to the Russian Legation. Parliament was then recalled, and the Shah was deposed. On July 17, 1909, his son, Ahmed Mirza, a child of 11, was proclaimed Shah with Azod ul Mulk, a prominent Nationalist, as Regent. The ex-Shah was given a pension and exiled.

On Aug. 31, 1907, a convention was signed by Great Britain and Russia in reference to Persia. A line, starting with Kasr i Shirm, passing through Ispahan and Yezd and ending at the Russian-Afghan frontier, was drawn; above this line was to be Russia's "sphere of influence," below it England's. In order to discredit the new government these two Powers fomented internal disorder, they encouraged the semiwild tribesmen to make raids and supported the rebellious partisans of the deposed Shah.

A new Parliament was elected, which met on Nov. 15, 1909, and, finding the finances of the Kingdom in a very bad way, began to negotiate for loans in Great Britain and Russia. In the following year Great Britain protested that the Southern trade routes were being disturbed by brigands and that unless order was restored within three months a local police would be organized under British officers at the expense of the Persian revenue customs. The reply of Parliament was that the disorders were due to the presence of Russian troops and to the encouragement given by foreigners to the ex-Shah, who was constantly invading the country.

A most important event in the history of Persia was the appointment as Treasurer Gen-

eral of the Kingdom of W. Morgan Shuster, who was recommended by President Taft of the United States. To Mr. Shuster were given very large powers. He had full financial control, could supervise all expenses, and make important administrative changes; but his efforts met the constant opposition of Great Britain and Russia. One of the greatest problems was the collection of taxes, which were levied unscientifically and collected fitfully. The new Treasurer General organized a special force, the "treasury gendarmes," to enforce the payment of taxes. This aroused the bitter hostility of the wealthy Persians who had long escaped such burdens and of the officials and politicians who saw in such an administration the end of bribery and corruption. Foreign interference now became more active than ever, and a demand was made to dismiss the treasury gendarmes on the charge that they had insulted Russian officials. Parliament stood by Mr. Shuster, who declared that a restoration of the finances meant the restoration of order and denounced the efforts of the Powers to checkmate his efforts for reform.

On Nov. 29, 1911, an ultimatum was sent to the Persian government by Russia demanding the dismissal of Mr. Shuster and the employment of a new Treasurer General to be selected by Russia and England. Parliament refused the Russian demand, and a body of Russian troops were dispatched to enforce the ultimatum. Persia was in a critical situation. She was not in a condition to resist and was finally compelled to yield. Mr. Shuster was dismissed, and a Belgian, M. Mornard, was appointed his successor.

In 1912 Great Britain and Russia each agreed to loan Persia £100,000 in return for the recognition by the Persian government of the Russian-English Convention of 1907. This was done, and Persia can no longer be considered as an independent sovereign nation, for she is really partitioned between these two Powers. Great Britain had now entered into an alliance with Russia, her ancient diplomatic enemy in the East, in order to bring about a great *entente* between France, Russia, and herself in regard to Germany. The partition of Persia may be rightly regarded as one of the important steps leading to the Great European War of 1914. See WAR IN EUROPE.

The dismissal of Mr. Shuster was followed by disorders and uprising. The barbarous tribesmen began making raids, and insurrections were started by Salar ed Dowleh, the ex-Shah's half brother, who was a pretender to the throne. The latter was gotten rid of by an agreement to pay him \$9000 a year on condition that he live in Switzerland. On July 21, 1914, young Ahmed Mirza, now 16 years old, was proclaimed Shah, and the regency was abolished.

The Belgian, M. Mornard, was compelled to resign his position as Treasurer General, owing to the pressure of Russia. It seems to be the determination of the Czar's government to annex northern Persia outright, as large numbers of Russian peasants are pouring into this region and a Russian army is maintained there to protect Russian interests.

Bibliography. General description: Friedrich Spiegel, *Eran, das Land zwischen Indus und Tigris* (Berlin, 1863); id., *Eranische Altertums-kunde* (Leipzig, 1871-78); C. J. Wills, *The Land of the Lion and Sun; or, Modern Persia*

(London, 1883); id., *Persia as It Is* (ib., 1886); Mme. J. P. Dieulafoy, *La Perse, la Chaldée, et la Susiane* (Paris, 1886); James Bassett, *Persia, the Land of the Imams* (New York, 1886); S. G. W. Benjamin, *Persia and the Persians* (Boston, 1887); Sir A. H. Layard, *Early Adventures in Persia* (2 vols., London, 1887; 2d ed., 1 vol., ib., 1894); I. B. Bishop, *Journeys in Persia and Kurdistan* (ib., 1893); S. G. Wilson, *Handbook for Asia Minor, Transcaucasia, Persia, etc.* (ib., 1895); Sir T. E. Gordon, *Persia Revisited, 1895* (ib., 1896); W. B. Harris, *From Batûm to Baghdad* (ib., 1896); E. L. Weeks, *From the Black Sea through Persia and India* (ib., 1896).

Description and travel: E. T. Collins, *In the Kingdom of the Shah* (London, 1896); E. Kauder, *Reisebilder aus Persien, Turkestan und der Türkei* (Breslau, 1900); C. E. Yate, *Khurasan and Sistan* (Edinburgh, 1900); D. G. Hogarth, *The Nearer East* (New York, 1902); P. M. Sykes, *Ten Thousand Miles in Persia* (ib., 1902); A. H. S. Landor, *Across Coveted Lands* (2 vols., ib., 1903); A. G. K. Le Strange, *Lands of the Eastern Culphate* (Cambridge, 1905); Raphael Pumpelly, *Explorations in Turkestan, 1903-04*, published by the Carnegie Institution (2 vols., Washington, 1905-08); E. C. Williams, *Across Persia* (London, 1907); John Fryer, *A New Account of East India and Persia: Being Nine Years' Travel*, edited by William Crooke for the Hakluyt Society (2 vols., ib., 1909-12); Sven Hedin, *Overland to India* (ib., 1910).

Antiquities: Dunousset, *Les populations de la Perse* (Paris, 1859); Nicolas de Khanikoff, *Mémoires sur l'ethnographie de la Perse* (ib., 1866); Houssay, *Les peuples actuels de la Perse* (Lyons, 1888); Schiaparelli, *Sull' etnografia della Persia antica anteriore alle invasioni arane* (Torino, 1888); E. C. F. Babelon, *Manual of Oriental Antiquities*, translated by B. T. A. Evetts (London, 1889); Albert Gayet, *L'Art persan* (Paris, 1895); Isfahani, *Anglo-Persian Idioms* (Cambay, 1896); S. G. Wilson, *Persian Life and Customs* (London, 1896); Friedrich Ratzel, *History of Mankind*, translated by A. J. Butler (3 vols., ib., 1896-98).

History: Sir John Malcolm, *History of Persia* (2d ed., 2 vols., London, 1829); H. J. Brydges, *The Dynasty of the Kajars*, translated from Persian manuscript (ib., 1838); A. C. Barbier de Meynard, *Dictionnaire géographique, historique et littéraire de la Perse* (Paris, 1861); J. E. Polak, *Persien, das Land und seiner Bewohner* (Leipzig, 1865); R. G. Watson, *A History of Persia from the Beginning of the Nineteenth Century* (London, 1873), a continuation of Malcolm's history; John Piggot, *Persia, Ancient and Modern* (ib., 1874); C. R. Markham, *A General Sketch of the History of Persia* (ib., 1874); id., *Eastern Persia: An Account of the Journeys of the Persian Boundary Commission, 1870-72* (ib., 1876); Ferdinand Justi, *Geschichte des alten Persiens* (Berlin, 1879); Theodor Nöldeke, *Aufsätze zur persischen Geschichte* (Leipzig, 1887); A. von Gutschmid, *Geschichte Irans und seiner Nachbarländer* (Tübingen, 1888); Curzon, *Persia and the Persian Question* (London, 1892); Jacques De Morgan, *Mission scientifique en Perse* (Paris, 1894-96); Ferdinand Justi, "Geschichte Irans von den ältesten Zeiten bis zum Ausgang der Sasaniden," and Paul Horn, "Geschichte Irans in islamitischer Zeit," in Geiger and Kuhn,

Grundriss der iranischen Philologie, vol. iii (Strassburg, 1900-04); Joannès Feuvrier, *Trois ans à la cour de Perse* (Paris, 1899); Eduard Meyer, "Das Perserreich und die Griechen," in *Geschichte des Altertums*, vol. i (Stuttgart, 1901); G. B. Grundy, *The Great Persian War* (New York, 1902); H. J. Whigham, *The Persian Problem* (ib., 1903); Valentine Chirol, *The Middle Eastern Question* (ib., 1904); P. Kershasp, *Studies in Ancient Persian History* (London, 1905); A. V. W. Jackson, *Persia Past and Present* (ib., 1906); F. B. Bradley-Birt, *Through Persia from the Gulf to the Caspian* (New York, 1909); E. G. Browne, *The Persian Revolution of 1905-09* (London, 1910); G. S. A. Ranking (ed.), *History of Minor Dynasties of Persia* (Oxford, 1910); David Fraser, *Persia and Turkey in Revolt* (London, 1910); W. M. Shuster, *The Strangling of Persia* (ib., 1913); P. M. Sykes, *History of Persia* (2 vols., New York, 1915). See GLASS; TAJIKS; TATS.

PERSIAN (pēr'shan or pēr'zhan) **ART**. The history of Persian art, including in its broadest sense architecture, sculpture, and other branches, falls into two main divisions—that dating from ancient times down to the Mohammedan conquest in the seventh century A.D. and that following this event. Several periods of development may be distinguished: 1. Prehistoric and Early Iranian, or before the eighth century B.C.; 2. Median (700-550 B.C.); 3. Old Persian, or Achæmenian (550-330 B.C.), followed by an interregnum after Alexander's invasion; 4. Parthian, or Arsacid (250 B.C.-226 A.D.); 5. Sassanian (226-650 A.D.); 6. Mohammedan, after the Moslem conquest of Persia (650 A.D. to the present).

Prehistoric and Early Iranian. Little if anything is known regarding art conditions during the archaic period of Iran's development before the rise of the Medes and Persians. Such little evidence as can be adduced is based largely on inferences drawn from scanty and crude vestiges that are supposed to date back to a high antiquity; or it is deduced from incidental allusions in the Avesta, or Zoroastrian Scriptures, if the passages containing them actually reflect conditions so old.

Median Period. The earliest achievements of the Medes, in architectural art especially, may be judged from references in literature, like the description of the magnificent battlements that surrounded the hill at Ecbatana (modern Hamadan) and were crowned by the palace of Deioeces, the first Median monarch, as recorded by Herodotus (1, 98-99). According to the account of Polybius (10, 27), who wrote in the second century B.C., the palace itself and the temple of the goddess Aena or Anais, corresponding to Anaitis (q.v.), were edifices built of wood overlaid with platings of gold and silver (offset by costly tiles), the precious metal of which still furnished priceless treasure for the ravaging armies of Alexander and his successors to carry away. The style of the structures must have formed a brilliant and light contrast to the heavy brick architecture of the Babylonians, even though influenced by the same. Median architecture must likewise have shown traits borrowed from Assyria and also from Asia Minor. Support is given to this view by certain stylistic elements in the very few remains of Median rock-cut tombs which antedate those of the great Persian kings. Beyond these there are only sporadic traces of

Median art surviving, such as some specimens of pottery, modeling, and carving, which are supposed to belong to that era.

Great Persian Period. The ruins at Pasargadæ, Persepolis, and Bahistan, or Behistun, furnish ever enduring monuments of art under the Achæmenian kings. The conquests of Cyrus and his successors seem to have led to certain modifications of style, even though the Persian touch made the artistic product one of its own. Architectural features, sculptural and decorative methods or designs, were adopted from Lydia and even from Egypt; stone replaced the earlier wood adorned by metal. Sculpture and glazed tiles, copied again from Assyro-Babylonian types both in style and subject, found wider vogue, especially in the beautiful enameled brick remains discovered at Susa, while additional traits of archaic Ionian Greek art found their way farther into Persia, as is presumed. Amid all these transformations, however, the Persians adhered to their open-air architecture, to their large light palace halls, as shown by the remains at Pasargadæ and particularly at Persepolis (q.v.).

A most original compound, the keynote to the Achæmenian architectural style, is what is termed the Persepolitan column, found also in great perfection at Susa. It is extremely slender, has numerous channelings, and stands on an elaborate bell-shaped base. Its capital is the most complicated of all ancient types, being usually in three superposed parts—the lower bell-shaped, the middle a fair-faced group of vertical volutes, the upper two bulls back to back. These columns appear to have supported wooden beams and were much more widely spaced than either the Greek or Egyptian columns. The most important remains are those of the terrace, gateways, and pillared throne halls of Darius and Xerxes at Persepolis and of Artaxerxes at Susa. Enameled and molded bricks of cement, forming relief pictures in brilliant colors, were a feature of the palace at Susa. The remnants of a ruined temple at Kangavar, near Kermanshah, consecrated probably to the Persian river goddess Anaitis (q.v.), show signs of Greek influence in its columns and masonry and may date towards the end of the Achæmenian era, even if some authorities are inclined to assign its construction to a still later period, falling under the Parthian sway which followed Alexander's invasion. The size and magnificence of the monuments increased with the expansion of the Empire, but, after culminating under Darius (see PERSEPOLIS), had been waning for over a century when Alexander conquered Persia.

Parthians and Sassanians. In vain the Hellenistic art of the period succeeding Alexander sought under the Seleucids to impose its yoke on these provinces. There is almost a blank until national existence was revived under the Parthian dynasty of the Arsacids. Even then art did not rise above mediocrity, for the dominant race was not artistic. The palace of Hatra, attributed to them, shows the heavy walls, small chambers and vaults of Assyro-Babylonian art, but the material is stone, and the ornamentation shows Greek influence. Some scholars, moreover (like Herzfeld, "Hatra," in *Zeitschrift der deutschen morgenländischen Gesellschaft*, vol. lxviii), urge the presence of Arab influence upon the structure.

Under the Sassanian Empire a real artistic

renaissance, almost thoroughly Oriental, took place, which lasted until the Arab conquest in the seventh century A.D. Earliest of all come the domed palaces of Pars and Sarvistan; then that of Firuzabad, and finally those of Ctesiphon and Mashita, with characteristic Iranian elliptic domes and partial return to Babylonian brickwork in place of Hellenic stone. Finally, as a transition to Byzantine art, already heralded at Mashita, with its wealth of decoration, come the palaces of Rabbath-Ammon and Eivan. This Sassanian art had many forms that are now destroyed. Its hangings and its rugs, with designs inherited from the earliest times, were doubtless models for mediæval workmen. Of its goldsmith work the silver cup of Khosru in Paris is a magnificent example, with clear lines and crisp details, influenced by the barbaric Greek school of the Black Sea and the Bosphorus. Coins and medals, seals, ivories, and cut gems, all show this mixture of influences. Allusions to the art of the sculptor, which was quenched by Moslem iconoclasm, will be found below.

Mohammedan Persia. All the earlier Mohammedan monuments of Persia, of the period of her domination of the Caliphate of Bagdad, were destroyed by the Mongols under Genghis Khan (c.1200). But Persian art revived in the fourteenth century and developed a new architecture which reached the highest splendor under the Sufi Shahs (1499-1694); an architecture of brick vaults and walls, brilliant tile facings, bulbous domes, huge portal niches, and round minarets. It was the parent of the Mogul style in India and of the Seljuk style in Iconium and in Turkestan. The Persian was the only Mohammedan school consistently to allow the use of the human figure in design—in wall paintings and illuminations, in metal sculpture and textiles. This school radiated into India and influenced all other Islamic schools, such as the Syrian, Spanish, and even, though slightly, the Egyptian. Even in modern times Persian art has retained its character and influence, its beauty of color and design, while other Eastern schools have to a greater or less extent died out, and it has not been without effect in raising the standard of taste in Europe and America, especially by its rugs and hangings.

Sculptural Art before the Mohammedan Conquest. Among the early arts of Persia, outside of the grand achievements in architecture, may be noted certain beginnings made in the line of sculpture, although the development of this artistic branch was lopped off by the Mohammedan conquest in the seventh century A.D. In archaic Iran there seem to be indirect traces of images or idols going back possibly to very remote times, as indicated by references in the Avesta and later Zoroastrian texts (e.g., *Av. Yasht*, 5, 126-129; *Vend.*, 19, 20-25; cf. *Strabo*, 15, 114), although the sin of idol worship was an abomination accursed by true followers of the faith of Zoroaster, as shown by references in Pahlavi literature (collected by Jackson, in the *Memorial Volume of Sir Jamsetjee Medressa*, Bombay, 1915). The stone lion at Hamadan (ancient Ecbatana) is notable as carved in the round in ancient times, possibly Median, whilst the bas-relief sculptures at Pasargadæ, Bahistan, and Persepolis have been alluded to above. An old Parthian sculpture of King Gotarzes (46-51 A.D.), chiseled in low relief near the base of the famous Bahistan

Rock, was almost obliterated in the eighteenth century of our era by a modern inscription incised at that time, but leaves traces of what the sculptor's art may then have been. Important remains of rock bas-reliefs made by Sassanian kings at Naksh i Rostam and Naksh i Rajab, near Persepolis (q.v.), have been alluded to above, as well as at Tak i Bustan, near Kirmanshah, and likewise on the Plain of Dilman in northwestern Persia, in addition to those in the south at Shapur and elsewhere.

Miniatures and Illuminated Manuscripts. The artistic creativeness of Persia reached one of its highest achievements, six or seven centuries ago, in Mohammedan times, in the production of miniature painted illustrations and decorative illuminations found in manuscript copies of the works of classic Persian authors. In their special line these miniatures are unrivaled in the history of art, whilst the scribes of the highly embellished texts themselves were unmatched in calligraphy, because the art of beautiful penmanship has always been regarded among the Persians as one of the most refined of all accomplishments. It is true that the earliest existing manuscripts of the old Avesta, though characterized by handsome handwriting, are relatively of too late a date to show what may have been the scribe's art in bygone days. Fragments, however, of Manichean manuscripts dating from between 600 and 900 A.D., or directly after the Sassanian era, have been found by Grünwedel, Le Coq, Stein, and others, at Turfan in eastern Turkestan, which are exquisitely written and adorned by a few small miniatures. These, combined with other testimony, furnished documentary evidence of Persian art in this line during the first Christian millennium, and comprise an admixture of the Oriental antique with Chinese style. Such fragments well entitle Mani, the founder of the religious sect of the Manichæans in the third century A.D., who was an artist as well, to his title "the Painter," besides his theological fame as an attempted reformer of Zoroastrianism in his day.

After the Mohammedan conquest there are evidences of the development of painting under the Fatimid caliphs, Abbasids, and the successive dynasties of the Safarids, Samanids, and Ghaznavids, down to the thirteenth century. The Timurid school, or line of artists developed after the time of the great conqueror, Tamerlane (Timur Lang), at Samarkand, Herat, Bokhara, and elsewhere, made notable advances in miniature painting and illumination during the fourteenth and fifteenth centuries, as is proved by specimens still existing.

The most famous of all the Persian miniature painters, and one whose brush illustrated pages in manuscripts now priceless, was Bahzad (Pers Bahzād or Bihzād), who lived at the Safarid court as royal artist (between 1460 and 1525). His name is signed so minutely and delicately in these exquisite paintings that it requires a microscope to decipher the signature. Among his greatest pupils and successors was Mirak (c.1475-1545 A.D.) of the Bokhara school, though he came from Ispahan and began his work at Herat in Bahzad's later years. Still later in the list of Persian miniaturists, who derived their skill from Bahzad, was the artist Sultan Mohammed at the court of Shah Tahmasp in the first half of the sixteenth century; he was not only deft with the brush, but remarkable also for his artistic productivity.

Among other artists in this realm was Riza Abbasi (Pers. Rida 'Abbasi), who flourished about 1640 and remains celebrated for all time by the consummate skill with which he outlined figures of personages by a few masterly sketched strokes.

The influence of Persian miniature painting came into striking prominence in India under the Mogul emperors in the seventeenth century and still survives there to-day. Turkey even earlier felt the Persian artistic touch which penetrated through Italy to Europe at that period. Viewed in the broadest light, it may be said that the specimens of Persian miniature paintings, which illustrate their best-known poets and are embellished by richly decorated frontispieces, sectional headbands, and artistic designs in the use of the original script, together with the use of the finest paper and sumptuous bindings in leather and particularly later, in India, in lacquer, furnish standards of the highest excellence in their own peculiar field. Other examples of the painter's art in Persia vary from portraits and designs, like those which adorned the palace of Shah Abbas at Ispahan, in the early seventeenth century, down to the most modern times. Important collections of Persian manuscripts with miniatures are to be found at London, Paris, Vienna, St. Petersburg, and Berlin, as well as in New York and Boston. See GLASS.

Bibliography. A. Coste, *Monuments modernes de la Perse* (Paris, 1867); M. A. Dieulafoy, *L'Art antique de la Perse* (5 vols., ib., 1884-89); Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. v (ib., 1890); Albert Gayet, *L'Art persan* (ib., 1895); Friedrich Sarre, *Denkmäler persischer Baukunst* (Berlin, 1901); Saladin and Migeon, *Manuel d'art musulman* (Paris, 1907); C. I. Huart, *Les calligraphes et les miniaturistes de l'Orient musulman* (ib., 1908); Sarre and Herzfeld, *Iranische Felsreliefs* (2 vols., Berlin, 1910); Josef Karabacek, "Riza-i Abbasi" and "Muhammedanische Kunststudien," in *Sitzungsberichte der Kaiserlich Akademie der Wissenschaften* (Vienna, 1911, 1913); Sarre and Martin, *Die Ausstellung von Meisterwerken muhammedanischer Kunst* (Munich, 1912); especially also Sarre and F. R. Martin, *The Miniature Paintings of Persia, India, and Turkey* (2 vols., London, 1913), together with the works of Blochet and others cited in the bibliography that prefaces Jackson and Yohannan, *A Catalogue of Persian Manuscripts in the Metropolitan Museum of Art* (New York, 1914).

PERSIAN GULF. An arm of the Arabian Sea, between the southwest coast of Persia and the Arabian peninsula (Map: Asia, Central, D 9). It is entered from the Gulf of Oman, a northwestern arm of the Arabian Sea, through the Strait of Ormuz, 30 to 60 miles wide, and stretches from southeast to northwest, with a length of 520 miles and a breadth of 150 to 200 miles. Its area is about 90,000 square miles, including 1400 square miles of islands, which are generally barren and desolate. The most important islands are Ormuz, Kishm, and the Bahrein Islands (qq.v.), the last being noted for important pearl fisheries. The coasts, which are mostly of limestone formation, are high and steep on the Persian, but low and sandy on the Arabian side. The gulf is, as a whole, shallow, with an average depth of 200 feet, having shoals and banks in many places. The only

considerable river entering the gulf is the Shat el Arab—the combined waters of the Euphrates and the Tigris.

PERSIAN INSECT POWDER. See INSECT POWDER.

PERSIAN LAMB. The skin of young lambs of Caracal or black sheep, used for fur garments and trimming and characterized by a pronounced tight curl covering the skin uniformly. Traditionally the pelts are taken from still-born lambs, but in actual practice they are mostly from lambs killed before they are a week old, as the curl of the wool becomes less pronounced as the lambs get older. The pelts vary considerably in quality and are rigidly graded by the market according to the closeness and particular character of the curl and the lustre of the fur, skins selling in New York at all the way from \$1 to \$15 apiece. The coarser grades are sometimes classed as astrakhan. The skins are dyed to give them more uniform color and improve the lustre. They are almost entirely imported, being produced in Bokhara, but in 1915 attempts were being made to introduce the sheep and breed the lambs in the United States.

PERSIAN LANGUAGE. The modern Iranian language of Persia. The earliest authentic specimens are found in the fragments of Handhala of Badghis in the first half of the ninth century and of Abbas of Merv (809 A.D.). Closely connected with the Middle Persian or Pahlavi (q.v.) and with Old Persian (q.v.), modern Persian has undergone scarcely any change from the time of Abbas and Firdausi (q.v.) to the present day. In structure the language is analytic, like English. It is indeed possible to trace a certain analogy between the development of the two tongues. As English has become an analytic language as compared with Anglo-Saxon, so Persian is analytic, while Old Persian is highly inflected. Again, as English received through the Norman conquest the Romance and Latin elements, Persian was enriched with a large vocabulary of Arabic loan words by the Mohammedan invasions. On the other hand, it is considered inelegant in English to overload one's style with Latinisms, while in Persian stylistic charm is in direct proportion to the Arabisms employed. The phonological deviations of modern from ancient Persian are comparatively few. The principal ones are as follows: OPers. *ai* becomes NPers. *ē*, *i*, as OPers. *Haraiva*, NPers. *Harē*, *Hart*, Herat; OPers. *au* becomes NPers. *ō*, *ū*, as OPers. *raučah*, NPers. *rōz*, *rūz*, day; initial OPers. *y* becomes NPers. *j*, as OPers. *yauviyā*, NPers. *jōi*, *jō*, *jū*, canal; initial OPers. *v* becomes NPers. *b* before *a*, *ā*, *e*, *i*, *iy*, but *g* before *u*, as OPers. *vasiy*, NPers. *bas*, much, but OPers. *viyatarayāma*, we crossed, NPers. *guš aštan*, to pass over; OPers. *f*, *d*, *θ*, sometimes become NPers. *h*, as OPers. *kaufa*, NPers. *kōh*, *kāh*, hill, OPers. *dadātuv*, let him give, NPers. *dāham*, I give, OPers. *gābu*, NPers. *gāh*, place; but initial Iranian *s*, which sometimes appears as *θ* in Old Persian, is retained as *s* in New Persian, as OPers. *θuora*, Av. *suora*, NPers. *surā*, red; Old Persian surds between vowels and after *r* or *n* become sonants in New Persian, as OPers. *asapan*, NPers. *šab*, night, OPers. *pitar*, NPers. *pidar*, *pidar*, father, OPers. *Varkāna*, Hyrcania, NPers. *gurg*, wolf. The accent in modern Persian falls in general on the last syllable of the word. The preterit tense of the verb, except

in the third person singular, however, keeps the accent of the stem, as *āfaridam*, I created. In the New Persian noun there is neither gender nor, properly speaking, case. The plural, however, distinguishes to some extent between animate and inanimate, as *gāvdn*, cattle, but *jāmāh*, clothes. The plural ending *-ān*, which is now usurped in colloquial speech by *-hā*, is the old genitive plural, as Av. *āfāfnām*, of the nights, NPers. *šābān*, nights. The genitive and adjective relations are denoted by *i* (called by the Arabic term *izāfat*, annexation), placed between the governing word and the following genitive and between the noun and the following adjective, as *raftan-i laškar*, departure of the army, *āb-i pāk*, pure water. This *i* is derived from the similar use of *hya* in Old Persian and *yač* in Avesta, as OPers *kāra hya manā*, my army (lit., army that of me), *kāra hya Bābiruvīya*, Babylonian army (lit., army that Babylonian), Av. *āšahe yač vahūtāhe*, of best righteousness (lit., of righteousness that the best). The dative, especially in the older poetry, is frequently expressed by an appended *rā*, as *pidar-rā guftam*, I said to the father. This *rā* is the survival of the same use of *rādiy*, for the sake of, in Old Persian, as *avahya rādiy*, on account of this. Adjectives are compared by adding *-tar* for the comparative and *-tarin* for the superlative, as *buzurg*, high, *buzurgtar*, *buzurgtarin*. The verb in Persian is extremely simple. It has three persons, two numbers, an indicative, imperative, and (rarely) a precativ, an infinitive, a present (active) and past (passive) participle, and a gerundive. The tenses of the indicative are the preterit, corresponding in force to the Greek aorist; imperfect (formed by prefixing *mi* or *hami* to the preterit), corresponding to the Greek imperfect; aorist, corresponding to the Latin indefinite present; present (formed by prefixing *mi* or *hami* to the aorist); and future (formed by prefixing *bi* to the aorist). The passive is formed by the past participle with auxiliary *šudan*, to be, as *pursidāh šudan*, to be asked, while active periphrastic tenses are formed by the participles and the infinitive with the verbs *ast*, etc., he is, *būdar*, to be, *avāstan*, to wish.

The dialects of Persian are both numerous and, especially from a linguistic point of view, important. They are divided into three groups, the Pamir, Caspian, and Central. The Pamir dialects are Wakhi, Shighni, Sarikoli, Roshani, Tajiki, Sanglici, Minjani or Mungi, Yidghah, and Yaghnobi. The Caspian group includes Samnani, Mazandarani, Lahijani, Gilaki, Talishi, and Tat or Judæo-Persian. The Central dialects embrace Gabri, Shirazi, Bahbahani, Sivandi, Yazdi, Zafrahi, Kashahi, Vonishuni, Kuhludi, Nayini, Natanzi, and Kashani. But few of these dialects have as yet received any literary culture.

Bibliography. Muhammed ibn Ibrāhīm, *Grammar of the Persian Language* (London, 1843); August Vullers, *Institutiones Linguae Persicæ* (2d ed., Giessen, 1875); Adolf Wahr-mund, *Praktisches Handbuch der neu-persischen Sprache* (ib., 1875); James Darmesteter, *Études iraniennes*, vol. i (Paris, 1882); Alexander Chodzko, *Grammaire de la langue persane* (ib., 1883); Salemann and Shukovski, *Persische Grammatik* (Berlin, 1889); C. I. Huart, *Gram-maire élémentaire de la langue persane* (Paris, 1889); Paul Horn, *Grundriss der neu-persischen Etymologie* (Strassburg, 1893); J. H. Hübsch-

mann, *Persische Studien* (ib., 1895); J. B. and P. K. Kanga, *Hints on the Study of Persian* (5th ed., Bombay, 1895); Fritz Rosen, *Modern Persian Colloquial Grammar* (London, 1898); Paul Horn, "Neupersische Schriftsprache," and Geiger, "Kleinere Dialekte und Dialektgruppen," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. i, part ii (Strassburg, 1898-1901); Mirza-Jafar and Korsh, *Grammatika persidskova yazyka* (Moscow, 1901); W. S. Tisdall, *Modern-Persian Conversation-Grammar* (London, 1902); L. H. Gray, *Indo-Iranian Phonology* (New York, 1902); H. C. Tolman, *Ancient Persian Leamoon and the Texts of the Achaemenian Inscriptions* (ib., 1908); J. T. Platts, *Grammar of the Persian Language*, revised by G. S. A. Ranking (Oxford, 1911); and a practical introduction to Persian by G. and F. Rosen, *Elementa Persica, Persische Erzählungen mit kurzer Grammatik und Glos-sar* (Leipzig, 1915). Dictionaries: John Richardson, *Dictionary: Persian, Arabic, and Eng-lish* (London, 1829); August Vullers, *Lexicon Persico-Latinum Etymologicum* (Bonn, 1855-67); Adolphe Bergé, *Dictionnaire persan-fran-çais* (Leipzig, 1868); A. N. Wollaston, *Complete English-Persian Dictionary* (ib., 1894) See CUNEIFORM INSCRIPTIONS

PERSIAN LILAC. See CHINA TREE; LILAC; MELIACEÆ; SYRINGA.

PERSIAN LITERATURE. The literature of Persia is, strictly speaking, divided into three great periods—old, middle, and new. In view, however, of the wide distinctions in chronology, language, and spirit, the Old Iranian literature, including the Avesta (q.v.) and the Old Persian inscriptions (see OLD PERSIAN), as well as the Middle Persian or Pahlavi (q.v.), may best be treated separately. The newer, or Modern Persian, literature, which began shortly after the Mohammedan conquest of Persia, is that which is usually implied by the term Persian literature. It is for the most part in verse, although prose is by no means lacking. The genius of the poetry of Persia lies in the ability to say old things in a new way. Perfection of form and euphony of phraseology are the marks of the Persian poet rather than lofty thought and sincere inspiration, while originality of theme is supplanted by fertility of conceits. The poetry is, consequently, so essentially different from that of the Occident that it is somewhat difficult for a Western reader to become interested in Persian verse unless he can habituate himself to the somewhat artificial poetic atmosphere to which he is transported. This artificiality, which to the Occidental mind is a defect, is to the Oriental a proof of genius. Nor is this view unreasonable. The freedom of the West has never existed in Persia. Crushed by a despotism, hampered by Mohammedanism, and circumscribed by social conditions, only a small range of subjects has been left open for the Persian poet. Striving to make the best of his material, he has been driven to elaboration rather than creation. The monotony which wearies the Westerner, whose meagre vocabulary cannot match the luxuriousness of synonyms and rhymes found in Persian, does not exist in the original. There the music of the verse and the dexterity of the turns of thought conceal the poverty of idea and give a pleasure which is real and justifiable.

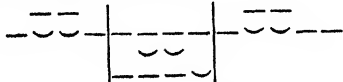
The first Persian poetry of which any extensive remains have survived was epic, with the

general metrical scheme, read from right to left, $\text{—} \cup \text{—} \text{—} \cup \text{—} \text{—} \cup \text{—} \text{—} \cup \text{—} \text{—}$. Here belong the fragments of a translation by Rudagi (tenth century) of Bidpai (q.v.). To judge from these fragments, his style was simple and free from trivial conceits. The Persian literary historians term him the sultan of bards and regard him as the first classical poet. About this period flourished Kisa'i, Khabbaz, Abu'l Abbas, Khusrawani, and Umara. When the Samanid dynasty fell before the attack of Mahmud of Ghazni (died 1030 A.D.), the conqueror gathered at his court the poets and philosophers of the time. Of them the laureate was Unsuri, the author of an epic entitled *Wāmik u 'Adhrā*, of which a few verses are preserved in Asadi's rhyming dictionary, and the composer of a long series of eulogies on his patron. Greater than he, however, was his rival, Farrukhi, a master of description, although artificial and Arabized, who bent his energies, like Anvari, Khakani, and others, to eulogies of Mahmud. To this period also belongs Daqiqi, who began the task of composing an epic on the legends of ancient Iran. The work of Daqiqi, amounting, according to tradition, to about 1000 couplets, was incorporated after his death into the greatest of all Persian epics and one of the masterpieces of world literature, the *Shāhnāmāh*, or Book of Kings of Firdausi (q.v.). Of the epic poets who immediately followed Firdausi but two names have survived. The first of these is Ali ibn Ahmad al Asadi at Tusi, of the eleventh century (generally, but perhaps erroneously, supposed to be the same as the lexicographer Asadi), the author of the *Garšāspnāmāh*, wherein he recounts in between 9000 and 10,000 couplets the deeds of Garshasp (a mutilation of the Avesta name *Keresāspa*), the grandfather, according to some traditions, of the legendary Iranian hero Rustam. The second is the *Shahryār-nāmāh* of Muhtari (died 1149 or 1159), who wrote of the adventures of Shahryar, the great-uncle of Rustam. Of this poem, the scene of which is in great part laid in India, only a few fragments remain. The other epics of this legendary cycle are anonymous. Of these probably the most important is the *Sām-nāmāh*, which almost equals in length the *Shāhnāmāh* itself, and contains the adventures of Sam, according to the Avesta the grandfather of Keresaspa; and still longer is the *Barzān-nāmāh*, which, like the comparatively short *Jahāngirnāmāh*, the *Farāmurnāmāh*, and the *Bānū Gušāspnāmāh*, also forms a part of the Rustam cycle. The legendary epic yielded, however, to the historical. Here it was the story of Alexander the Great, augmented by myths, which gave the first impulse. The poets Nizami, Amir Khusru, and Jami, from the twelfth to the fifteenth century, each wrote an *Iskandar-nāmāh*. This series was followed by a long line of epics, in many instances hardly more than rhymed chronicles, of comparatively little poetic worth. It will be sufficient here to name as the most important Ahmad Tabrizi's *Shāhanšāhnāmāh* on Genghis Khan and his successors until 1338, Abdullah Hatifi's (died 1521) *Timūr-nāmāh* on Tamerlane, and the long *Jārjnāmāh*, or Book of George, by Mulla Firuz ibn Ka'us, celebrating the English conquest of India up to the fall of Poona in 1817. Side by side with the legendary and historical epic the romantic epos was developed. Firdausi himself had set the example in his *Yūsuf u Zalikhā*, based on the story of

Joseph and Potiphar's wife. The type of the romantic epic is conventional. The lovers become enamored of each other through a dream or a description, and the interest then centres about their constancy and their trials. The hero and heroine are either Iranian, as in the 21 epics on the loves of the Sassanian Khusru, his wife, the fair Armenian Shirin, and her lover, Ferhad, the sculptor, and the 10 versions of Behram Gor's 7 (or 8) love adventures; or they are borrowed from the Arabs, as the 14 poems on Joseph and Zalikhā, the 7 on Wamik and Adhra, and the 18 on Laila and Majnun. After Firdausi the first great poet in this genre whose work survives was Fakhr ed Din of Gurgan (born about 1048). His poem, the *Wis u Rāmin*, in about 9000 couplets, relates the love of Wis, the young wife of the aged King Mobad of Merv, for his brother Ramin. The point of the epic, which has many old Iranian elements, lies in the repeated deception of the doting monarch, and it is marked by a humor which is piquant even if unethical. A far greater romantic epic poet than Fakhr ed Din was Nizami (died c.1203), who wrote poems on three of the favorite themes already noted, the loves of Laila and Majnun, of Khusru and Shirin, and of Behram Gor. These works, together with his historical epic, the *Iskandarnāmāh*, and his mystical poem, the *Makhzan-ul-asrār* (Treasury of Mysteries), made a *khamseh*, or pentade, which was imitated by many poets. (See NIZAMI.) Nizami thus became the model for the romantic epos in Persia. Of his successors the most important was Jami (1414–92) (q.v.), whose *Yūsuf u Zalikhā* and *Laila u Majnun* are not inferior to the corresponding poems of Firdausi and Nizami. Khwaja Kirmani (1281–1352) returned to the legendary epic in his *Humāi u Humāyūn*, which describes the love of Humai, son of the mythical Iranian hero Hushang (the Haoshaungia of the Avesta), for Humayun, Princess of China, and a similar story is told in the same poet's *Gul u Naurūz*, on the wooing of Gul, the Princess of Rome (i.e., Byzantium), by Nauruz, Prince of Khorassan. On the other hand, Amir Khusru, of Delhi (1253–1325), wrote a romantic epic of his own time, entitled *Duvalrānī Khidrkhān*, on the tragic loves of the Persian Prince Khidrkhān and Duvalrānī, Princess of Gujarat. The multitude of minor poets in this genre may be passed over. A noteworthy modification of the romantic epic, however, deserves mention. This is the mystical romance. Katibi (died about 1434) in his *Majma' al-Bahrain* (Union of the Two Seas), also called *Nāzir u Manzār* (Seer and Seen), set forth in Sufistic diction (see SUFISM) the mutual love of God and man, while Jami treated the same theme in his poem on the loves of Salaman and Absal. Here too belong, together with many others, the *Gūi u Caugān* (Ball and Mallet), also called *Hābnāmāh* (Book of Ecstasy), of Arifi (1438), and the *Shāh u Gadā* (King and Dervish), of Hilali (died 1532).

From the epic and romantic epos one turns to the lyric poetry. Here the verse schemes are for the most part borrowed from the Arabs, although the *rubā'i*, or quatrain (see RUBAIYAT) is distinctly Persian in origin. The principal lyric forms are five in number and are as follows: (1) The *kassida* (Persian *qasidah*, from Arabic, signifying a 'fragment' of a poem) is employed chiefly in eulogies. It consists of at

least 12 and at most 99 couplets (*bait*), the second lines of which must rhyme with the first two lines (*matla'*), thus giving the rhyme scheme *aa, ba, ca, da*, etc. The thought in each *bait* must be complete in itself, but need not be inseparably connected either with the preceding or following couplet. To employ the Persian figure, the rhyme is the thread on which the pearls of the *bait*s are strung. The frequent change of order of distichs which is found in Persian manuscripts of lyric poetry thus becomes easily explicable. (2) The *ghazal* (from Arabic *ghazala*, to be abundant) is identical in form with the *kassida*, but can have no more than 12 couplets, the last of which must contain the name of the poet. This verse is devoted especially to poems on love and wine. (3) The *kit'a* (from Arabic *qata'a*, to cut off) is the same as the *kassida*, excepting that the *matla* is lacking. Its rhyme scheme is accordingly *ab, cb, db, eb*, etc. (4) The *mathnawi* (from Arabic *thanaya*, to fold) is a long poem of epic, mystic, or didactic content, with each *bait* or couplet rhyming, *aa, bb, cc, dd*, etc. (5) The *rubai*, or quatrain (from Arabic *rub'a'a*, 'four'), is preëminently the Persian form of epigram. Its metrical scheme, read from right to left, is:



and its rhyme is either *aana*, or *aaba*.

In general the Persian lyric differs from the epic only in those restrictions which the external form lays upon it. The spirit is practically the same. It is, of course, natural that the personal element should enter into the lyric far more than into the epic, and that we should find in its briefer compass a sublimation, as it were, of the conceits and mannerisms which are more scattered in the epic. The lyric poetry of Persia may be divided into the lyric proper, the religious and didactic, and the court poetry. In the first division love is the predominating *motif*, and the theme of next importance is wine. Into the purely subjective lyric, such as is familiar in modern Occidental poetry, the Persian does not enter. The love which is celebrated is either happy or, in the great majority of verses, blighted by the cruelty of, or separation from, the beloved. The poet rings countless changes on this single theme. He sighs for the curl and the mole, the sugar lip and the cypress form of the object of his devotion. In nearly every instance the love set forth is, at least superficially and exteriorly considered, sensuous. Of romantic devotion there is scarcely a trace in Persian literature, even in the greatest epics of the Joseph and Zalikha cycle. It is furthermore a characteristic of Persian erotic verse that the beloved is represented as a boy, as is shown, e.g., by the constant allusions to the skinker or *saqi*. This usage, strange and easy of misinterpretation to the Western reader, is borrowed from Arabic poetic usage. The explanation seems to lie, not in an assumption of low morality, but in the Arabo-Persian view that it is indelicate to refer openly to a woman. As the seclusion of women is universal throughout Mohammedan countries, the sole refuge left to the poet was to change in his verse the sex of his love. The incessant praise of wine was due to the fact that it is a forbidden drink.

Strict Mohammedan orthodoxy condemns the winebibber to hell on the authority of the Koran. The Persians, however, being Shiites in creed, are opposed on principle to the orthodox Sunnis, and as the old Iranians in pre-Islamic times were inclined to the use of wine, their descendants sing the praises of the grape in tones too real to be mistaken. Besides this exoteric reading of love and wine there is, however, an esoteric interpretation. The beloved is God, the curl is the transient charm which partially hides His face, the mole is the centre of His divine unity, and the wine is the ecstasy which fills man, the lover, at the thought of reunion with the Beloved, absent for a time and seemingly cruel. The literal interpretation too common in the West, which disregards or denies the mystic element in this poetry, may with some good reason be regarded as inadequate. It is self-evident, on the other hand, that a solely Sufistic view of these poems is equally misleading. The truth seems to be that there is no clear line of demarcation between the esoteric and the exoteric. Both were in many cases simultaneously present in the poet's mind.

In the Persian lyric by far the greatest names are those of Hafiz (q.v.) (fourteenth century), whose *ghazals* are his most famous poems, and of Omar Khayyam (q.v.) (died 1123), whose quatrains are the Persian poems best known to the Occident. Hafiz had been preceded by several poets, of whom Kamal ud din Isfahani (died 1237), Ibn Yamin (died 1344-45), and Salman of Sava (died 1376 or 1377) were the most noteworthy. After him came a long line of imitators of more or less ingenuity. Among them mention may be made of Jami, more famous as a didactic poet, and Amir Shahi (died 1453). Jami also had his lyric imitators, of whom the most noteworthy was Baba Fighani of Shiraz (died 1516 or 1519), who was called the minor Hafiz. With Jami, however, the lyric poetry of Persia reached its climax, even though minor poets wrote, and though Akbar sought to rekindle the dying flame by his royal patronage. Closely connected with the lyric proper is parody. Here belongs especially the name of Abu Ishak (died 1427), who devoted himself in his *Divan* to the glorification of gastronomy, sparing in his parodies neither Hafiz, Sadi, nor even Firdausi. A half century after Abu Ishak came Mahmud Kari, who sang the praises of clothes instead of food, and modeled a clothes state, which reminds one somewhat of Carlyle's *Sartor Resartus*, with burlesque substituted for philosophy. Besides the parody there is the lower vein of ribald verse, to which Orientals are somewhat inclined. Enough to mention the names of Sozeni (died 1173-74), Azraki (died 1132), and the greatest of them all, Ubaid Zakani (died 1370-71), beside whose verses even Martial loses piquancy. Here, too, is a Persian counterpart of Marguerite of Navarre, Mahisti, the favorite of the Sultan Sanjar (died 1157), who could write extremely spicy poems without forfeiting esteem. As is implied by the renown of Mahisti, Persian poetesses are not unknown. In the harem much fugitive verse was composed, chiefly, of course, of an erotic nature, but comparatively little has been preserved. As other subordinate forms of the lyric in Persia, the riddle and the *tarikh*, or chronogram, must be mentioned. The riddles do not differ essentially from those in other literatures. The chrono-

gram is, however, comparatively rare outside of Arabic and Persian. It is formed by the construction of an appropriate sentence, the sum of the numerical values of whose letters equals the year in which the event alluded to by the sentence occurred. It is stated by Kazwini, e.g., with regard to the entrance of Haasan ibn Sabbah, the notorious leader of the Assassins (q.v.), into the fortress of Alamut, which had anciently been called Alah Amut, that "by a strange chance the sum total of the letters *Al(a)h Amut* in the Arabic chronogram was the year of his entry into the castle." Adding the numerical values of the letters of this name, $a = 1, l = 30, h = 5, a = 1, m = 40, u = 6, t = 400$, we have the date of the event, 483 A.H. (= 1090 A.D.).

Closely connected with the lyric poetry of Persia, especially by the bond of mysticism, is the didactic and religious. So closely are the two related that it is sometimes impossible to decide to which class a poet belongs, because he in reality belongs to both.

The mystic and didactic poetry of Persia is entirely Sufistic in character. The greatest of all who wrote in this genre was Jalāl-ud-Dīn Rūmī (q.v.) (1207-1273), whose *Divān* and *Mathnawī* are among our most important sources for the study of Sufism. The first mystic poets, however, were probably Bayazid Bistami (died c. 874) and Abu Saïd ibn Abul Khair (968-1049), of whose works a number of quatrains have survived. In the eleventh century the *Rūšanā'nāmah* of Nasir i Khusru deserves mention. The earliest great predecessor of Jalal ud Din, however, was Farīd-ud-Dīn 'Attār (q.v.) (died 1299), whose *Mantiq ut-Tair* (Bird Parliament) is a remarkably beautiful allegory of the struggle of the soul to attain to the infinite. Here belongs also another of the greatest names of all Persian literature, Sadi (q.v.) (c. 1190-1291). His *Gulistan* (Rose Garden) and *Bāstān* (Garden) are among the greatest didactic productions of the East. The last important mystic poet was Mahmud Shabistari (died 1317), the author of the *Gulshān-i-Rāz* (Rose Garden of Mystery), which may serve as a textbook of Sufistic philosophy.

The court poetry, the third division of the lyric, is the least interesting of all from a literary point of view. The favor shown to poets from the earliest period of Islamic rule in Persia naturally encouraged the production of eulogies, which, with the luxuriance of Oriental imagination, are so fulsome as to cloy the Occidental reader. The metrical intricacy keeps pace with the increasing artificiality of the court poets. Such rhymes as *aaaaaaxxxxx, bbbbbbxxxx*, and so on, and a series of ghazals, united by *misra's*, or rhyming couplets at regular intervals, are common. Within the poems themselves there are conceits and obscure allusions which in many cases baffle even the ingenuity of an Oriental reader and give rise to commentary after commentary. From the long series of poets of this type the names of Watwat (1088-1182), Muizzi (died 1147), Khakani (died about 1199), and the greatest of them all, Anvari (q.v.) (died about 1190), may be mentioned.

The drama of Persia, apart from the miracle play of *Hasan and Husain* (q.v.), is of late development and little importance. The prose literature, as has been intimated, is also of small extent and value as compared with the poetry.

While it is true that Sadi in the works already mentioned intermingled prose and verse, and that his example was followed by Nakhshabi (died 1330) in his *Sindbādnāmah* (Book of Sindbad), it seems, nevertheless, strange that so few of the great Persian writers should have availed themselves of prose. There is, however, a mass of novels, tales, fables, legends, and anecdotes, as well as of history, encyclopedias, and the like. The oldest specimens of Persian prose are Muwaffak's book on pharmacology and Balamis' translation of Tabari, both dating from the tenth century. As authors of notes and travel we may mention Abu Tahir, whose numerous romances are concerned chiefly with old Iranian legends, as in his *Dāstān* or *Qahramānnāmah* (dealing with the legend of Hushang) and his *Darābnāmah* (on the story of Darius and Alexander), the anonymous writers of the *Sikandarnāmah* (on the Alexander legend), the *Qisṣah-i Hatīm Ta'i* (on Hatim Tai, proverbial for his generosity and nobility), and the modern Mohammed Takī (seventeenth century), the author of a huge romance in 15 volumes, entitled *Bāstān-i Xayāl*. There is besides a multitude of novelettes and of tales in the style of the *Arabian Nights* (q.v.). Here the most important are the *Baṭṭyār-nāmah* (Book of the Ten Viziers); the *Qisṣah-i ṣāḥār darvīsh* (Story of the Four Dervishes), perhaps by Amir Khusru (died 1325); the *Tutīnāmah* (Book of the Parrot), based on the Sanskrit *śukasaptatī*, and the *Bahār-i dāmī* (Spring Garden of Wisdom), by Inayat-ullah Kanbu (died 1671). The best known of all the prose fiction in Persian is Waiz Kashifi's (died 1504-05) *Anrār-i Suhaili* (Lights of Canopus), based on the *Kalīla wa Dimnah*, and so ultimately on the Sanskrit *Pancatantra* (q.v.), although the *Latā'if ut-tawā'if* (Witty and Amusing Stories) by Safi, the son of Waiz Kashifi, also deserves mention. As a proof that literary productivity, not only in prose but also in poetry, goes on in Persia in recent times, since the proclamation of the constitution in 1906, may be cited contributions from Persian newspapers, as shown in a volume by Prof. E. G. Browne, *The Press and Poetry of Modern Persia* (New York, 1914).

Bibliography. Joseph Hammer-Purgstall, *Geschichte der schönen Redekünste Persiens mit einer Blütenlese* (Vienna, 1818); Alexander Chodzko, *Specimens of the Popular Poetry of Persia* (London, 1842); Sir William Ouseley, *Biographical Notices of Persian Poets* (ib., 1846); A. C. Barbier de Meynard, *La poésie en Perse* (Paris, 1877); James Darmesteter, *Les origines de la poésie persane* (ib., 1887); Hermann Ethé, *Die hofische und romantische Poesie der Perser* (Hamburg, 1887); id., *Die mystische, didaktische und lyrische Poesie und das spätere Schriftthum der Perser* (ib., 1888); E. A. Reed, *Persian Literature, Ancient and Modern* (Chicago, 1893); Italo Pizzi, *Storia della poesia persiana* (Turin, 1894); Hermann Ethé, "Neupersische Litteratur," and Theodor Noldeke, "Das iranische Nationalepos," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii (Strassburg, 1896); L. S. Costello, *Rose Garden of Persia* (new ed., London, 1899); Paul Horn, *Geschichte der persischen Litteratur* (Leipzig, 1901); A. F. J. Remy, *Influence of India and Persia on the Poetry of Germany* (New York, 1901); Dole and Walker, *Flowers from Persian Poets* (ib., 1901); E. G. Browne, *Literary History of Persia*

(2 vols., New York, 1902, 1906); C. H. A. Field, *Persian Literature* (London, 1912); Dorothy Field, *Persian Literature* (ib., 1914). See ANTOLOGY.

PERSIAN MUSIC. See ARABIAN MUSIC.

PERSIAN MYTHOLOGY. Only scanty traces of the mythology of ancient Persia have survived. The reform supposedly instituted by Zoroaster (q.v.) seems to have swept away the older nature worship which prevailed in Iran as in India. It is evident, however, that this reform was not absolutely thorough, and that under the orthodoxy which was forced on the people by Vishtaspa, the royal patron of Zoroaster, according to the rather doubtful Parai traditions, there lurked many old beliefs and myths which were heritages of the Indo-Iranian religion. When the first enthusiasm of this Zoroastrian Protestantism died out, the ancient faith revived in some measure, and in the Yashts, a part of the Avesta (q.v.) late in form but almost certainly old in content, many mythological allusions may be found. In some of the Pahlavi texts (see PAHLAVI LITERATURE), especially in the Bundahish, there survive numerous traces of the primitive faith, despite the Zoroastrian orthodoxy to which they theoretically conform. The six Amshaspands, who in Zoroastrianism represent the cardinal virtues of Good Mind, Best Righteousness, Desirable Kingdom, Holy Concord, Health, and Immortality, were originally deities protecting respectively cattle, fire, metals, earth, water, and plants, being therefore nature divinities, although some scholars are inclined to regard the spiritual side of these deified concepts as the more original. Ormazd, who in the Zoroastrian reform became the chief and really the only god, was originally a sky deity, whose son was the fire and who was also the father of the Good Mind, or, in the early evaluation of this godling, of cattle. His daughter was Holy Concord, the earth, who from many allusions in the Yashts was a goddess of fertility. The demons, who play a subordinate part in the orthodox texts, find a more prominent place in the Yashts. Important here is the serpent Azhi Dahaka, who was probably the sky serpent, corresponding to the Vedic Vritra slain by Indra (q.v.), especially as the Bundahish describes him as falling from heaven. The Yashts emphasize the nature worship of the pre-Zoroastrian religion in the chapters devoted to the sun, the moon, the planet Tishtrya, who, mounted on a black horse (perhaps the storm cloud), defeats the demon Apaosha (drought), and to the waters, Anahita, who is the Anaitis (q.v.) of the classical writers. To all these not only heroes, but even Ormazd himself, offer sacrifices, clearly pointing to an earlier period when one god was dependent on another for aid. Ghost worship also (see GHOSTS) is represented by the cult of the Fravashis, who seem to have originally represented the spirits of the beneficent dead. The cosmogonic mythology (see COSMOGONY) seems possibly to be largely derived from Semitic sources, for the antithesis of Ormazd, the god of the sky and light, to Ahriman (q.v.), the god of darkness, and their conflict at the creation of the world, is precisely analogous to the battle of the Babylonian solar deity Marduk with Tiamat, the demon of chaos. About trees and animals myths clustered. In the white Hōm tree, which will give man immortality at the day of resurrection,

there is possibly a pre-Zoroastrian reflex of the Semitic tree of life, while the human-headed bulls of Assyrian sculptures are represented by Gopatshah, a being half bull and half man, who pours holy water into the sea. The myth of the combat between Tishtrya, as bringer of rain, and Apaosha, the demon of drought, which is vividly portrayed in the Avesta (Yasht, 8), seems, like numerous others, to have been lost to later Persian tradition. In fact, with the downfall of the Iranian religion before Mohammedanism, the old myths vanished almost entirely, so that the mythology of modern Persia is practically Islamic. However, the *pairika*, a female demon of Iran, is preserved as the beneficent *peri* of modern Persian folklore, and the *simurgh*, a bird of magic properties, has become the *roo* of the *Arabian Nights*. Consult Georg Hüsing, *Iranische Mythologie* (Leipzig, 1905); id., *Die iranische Ueberlieferung und das arische System* (ib., 1909); Carnoy, *Iranian Mythology* (Boston, 1915).

PERSIAN POWDER. See INSECT POWDER

PERSIAN RITE. See LITURGY.

PERSIGNY, pār'sé'nyé', JEAN GILBERT VICTOR FIALIN, DUKE DE (1808-72). A French politician, born at Saint-Germain-Lespinasse in the Department of Loire. He joined the hussars in 1828, but after the revolution of July, 1830, owing to doubts as to his loyalty, he was expelled from the army on a charge of insubordination. He now became a journalist in Paris, formed the most intimate relations with Louis Napoleon, and commenced a career of Bonapartist propagandism throughout France and Germany in which he displayed extraordinary energy, pertinacity, and fertility of resource. Articles from his pen had already appeared in *Le Temps*, and in 1834 he founded *L'Occident Français* as a Bonapartist organ. He had the chief hand in the affair of Strassburg (See NAPOLEON III.) He also took part in the expedition to Boulogne, where he was captured and condemned to 20 years' imprisonment. His confinement, however, became almost nominal, and he passed his time in writing a voluminous and singular work on the *Utilité des pyramides d'Egypte* (1844). On the breaking out of the revolution in 1848 Persigny hurried to Paris and set himself, with his accustomed vigor and swiftness, to organize the Bonapartists. He was appointed aid-de-camp to the President, Louis Napoleon, and major general of the Parisian National Guard. In 1849 he was chosen a member of the Legislative Assembly. He was sent to Berlin as Ambassador at the close of the same year. As was to be expected, Persigny took a prominent part in the coup d'état of Dec. 2, 1851. In January, 1852, he succeeded Morny as Minister of the Interior. From 1855 to 1858 and again from 1859 to 1860 Persigny was the French Ambassador to Great Britain. He was recalled to France, however, in 1860, to resume the office of Minister of the Interior. This office he resigned in June, 1863, when the elections of Paris and other large towns showed dissatisfaction with his policy. In the autumn of the same year he was created Duke. He did not long survive the overthrow of the Second Empire, his death occurring at Nice, Jan. 13, 1872. Consult: Joseph Delaroâ, *Le duc de Persigny et les doctrines de l'empire* (Paris, 1865); Taxile Delard, *Histoire du Second Empire* (6 vols., ib., 1868-75); also references under NAPOLEON III.

PERSIMMON (from the Virginia Indian name), or **DATE PLUM**, *Diospyros* (family Ebenaceæ). A tree and its fruit, including several species growing wild and cultivated to some extent. The Japanese persimmon or kaki (*Diospyros kaki*) is the principal native fruit of Japan. It is found also in Korea, eastern and southern China, and parts of the East Indies. It is grown to a limited extent in southern Europe and was introduced into the United States about 1875. It finds a congenial climate in California and in the Gulf and South Atlantic States as far north as Virginia. The cultivated trees grow 8 to 12 feet high and bear a very attractive yellow, thin-skinned globose fruit often attaining the size of a medium orange. When ripe the fruits contain a soft sweetish pulp. A number of varieties are in cultivation, and these vary much in size, color, the number of seeds they contain, period of ripening, etc. The American persimmon (*Diospyros virginiana*) is native from Connecticut and Kansas south to central Florida and eastern



AMERICAN PERSIMMON (*Diospyros virginiana*).

Texas. Wild trees sometimes reach a height of 60 feet in the forest and are valuable as cabinet woods. In the open the trees seldom exceed 20 to 30 feet in height. Another American species, *Diospyros texana*, is grown in Texas. The fruits of the American persimmon are much smaller than those of the Japanese varieties, are very soft when ripe, and on this account are seldom marketed.

Persimmons are propagated from seed. Varieties seldom reproduce themselves, and so budding and grafting are resorted to. Seed sown in the fall is allowed to grow the following season. The second spring the seedlings are either budded or crown-grafted. Grafting gives the better results. Native trees may be successfully top-grafted with improved varieties. In transplanting to the orchard trees one to two years from the graft are preferred. Persimmons thrive on nearly all soils. Like other orchard fruits, they respond generously to cultivation. Trees come into bearing within four years after setting in the orchard. Top-worked trees produce fruit within three years from the graft. Some Japanese varieties are inclined to overbear and should therefore be thinned. Other varieties require male or staminate trees in the orchard to insure proper pollination. Such seedless varieties as *Tanenashi* and *Tamopan* appear to set fruit well without pollination. The green fruit of all varieties of persimmons is extremely astringent and maintains this condition until fully ripe. The ripening period of

the different varieties varies from August until December. Some native persimmons ripen before frost, which greatly improves others. The Japanese sorts should be gathered before frost and stored in a cool, well-ventilated, moist room until fully ripe. In Japan the fruit is packed in newly emptied sake or beer casks, the heads immediately replaced, and the packages made air-tight. In from 5 to 15 days, according to the prevailing temperature, the fruit may be removed in a firm, sound condition, with the astringency gone, and ready to ship long distances. F. E. Lloyd and H. C. Gore both found in 1911 that fruit for local distribution may be successfully processed with carbon dioxide. The fruit is usually consumed fresh as a dessert or out of hand. Some varieties may be dried or preserved. Consult: Hadley and Troop, "The American Persimmon," in *Indiana Agricultural Experimental Station, Bulletin No. 60* (Indianapolis, 1896); Lloyd, "The Artificial Ripening of Persimmons," in *Alabama State Department of Agriculture, Bulletin No. 42* (Montgomery, 1911); Gore and Fairchild, "Experiments on the Processing of Persimmons to Render them Non-Astringent," in *United States Bureau of Chemistry, Bulletin No. 141* (Washington, 1911); H. C. Gore, "Large Scale Experiments on the Processing of Japanese Persimmons, with Notes on the Preparation of Dried Persimmons," in *United States Bureau of Chemistry, Bulletin No. 155* (ib., 1912); Watts, "Persimmons," in *Tennessee Agricultural Experimental Station, Bulletin No. 11* (Nashville, 1899). In the latter bulletin both native and Japanese persimmons are considered. See Plate of PAPAW AND PERSIMMON.

PERSIMMON INSECTS. The persimmon does not suffer greatly from the attacks of insects. Several caterpillars may occasionally defoliate individual trees, especially the larvæ of *Spilosoma virginica*, *Orygia leucographa*, *Tolype vellela*, and *Ademasia concinna*. The little leaf miner (*Aspidusca diospyrella*) forms a minute blotch mine in the leaves of this tree and eventually cuts out a case in which it pupates. One of the plant lice (*Aphis diospyri*) seems to be specifically attached to this tree, but does little damage, and the same may be said of one of the flea lice (*Psylla diospyri*). One of the weevils of the family Otorhynchidae, viz., *Brachystylus acutus*, is found only on the persimmon, but does comparatively little damage.

PERSIO. pēr'si-ō. See ARCHIL.

PERSISTENCE IN TIME. See DURATION.

PERSISTENCE OF VISION. See VISION, *Duration of Visual Sensations*.

PERSIUS (AULUS PERSIUS FLACCUS) (34-62 A.D.). One of the most famous Roman satirists. He was born at Volaterræ (now Volterra) in Etruria, 34 A.D. He was of a distinguished equestrian family, was educated under the care of the Stoic philosopher Cornutus, and lived on terms of intimacy with the most distinguished personages of his time in Rome. The principal authority for the life of Persius is an abridgment of a "commentary" by one Probus Valerius. Modest and gentle in his manners, virtuous and pure in his whole conduct and relations, he stands out conspicuously from the mass of corrupt and profligate persons who formed the Roman "society" of his age, and vindicated for himself the right to be severe by leading a blameless and exemplary life. His six satires were greatly admired, not only in

Persius' own day, but all through the Middle Ages; but the estimate which modern critics have formed of his writings from a literary point of view is not so high. He is remarkable for the sternness with which he censures the corruption of morals then prevalent at Rome, contrasting it with the old Roman austerity and with the Stoic ideal of virtue. His language is terse, homely, and sometimes obscure, from the nature of the allusions and the expressions used, but the dialogues are the most dramatic in the Latin tongue. The *editio princeps* appeared at Rome in 1470; later editions are those of Isaac Casaubon (Paris, 1605); Passow (Leipzig, 1809); Jahn (ib., 1843); Gildersleeve (1875); Hermann (Leipzig, 1881); Conington (with an English translation and commentary, revised by Nettleship, Oxford, 1893); Bücheler (Berlin, 1893); and Van Wageningen (1911). Persius has been frequently translated, the two best English translations are those by Dryden and Conington. Consult: H. E. Butler, *Post-Augustan Poetry* (Oxford, 1909); Martin Schanz, *Geschichte der römischen Literatur*, vol. ii, part ii (3d ed., Munich, 1913); also M. H. Morgan, *Bibliography of Persius* (Cambridge, Mass., 1909).

PERSON (OF. *persone*, Fr. *personne*, from Lat. *persona*, person, actor's mask, from *personare*, to sound through, from *per*, through + *sonare*, to sound, from *sonus*, sound; connected with Skt. *svana*, sound, from *svan*, to sound). In theology the word "person" is applied to the distinctions in the divine Trinity in a modified sense. Sabellius applied the Greek word *prosopon* (face) to the Father, Son, and Spirit, on the supposition that they were three separate appearances, or faces, of the one divine nature. In the Trinitarian controversy culminating at Constantinople (381), the orthodox party accepted the term, but affirmed that the "faces" were eternal faces, or were manifestations of eternally existing distinctions. The natural tendency of the word, when "person" had come to mean a separate individuality, was to emphasize the separateness of the Trinitarian hypostases, and in that respect it had a bad influence.

PERSON. In law, a term descriptive of all those who may have legal rights or obligations. It comprehends living men, women, and children, including *en ventre sa mere*, all of whom are called natural persons, and corporations, which are known as artificial persons. The legal capacity of persons, which varies greatly according to age, sex, and status, is commonly dealt with under the head of the law of persons. See CAPACITY, INCAPACITY; ALIEN; HUSBAND AND WIFE; MARRIAGE; INFANCY; BASTARD; DOMESTIC RELATIONS.

PERSON, SECURITY OF. See SECURITY OF PERSON.

PERSONA GRATA (Lat., acceptable person). A term applied to a diplomatic agent, indicating that he is acceptable to the sovereign to whom he is accredited. See DIPLOMATIC AGENTS.

PERSONAL ACTION. In the early history of common-law procedure in England, an action against a person for damages for an injury committed by him as distinguished from an action to recover a specific thing, such as land, of which the plaintiff had been wrongfully deprived, and which was accordingly known as a real (Lat., *res*, thing) action. Hence the kind of property specifically recoverable by such an

action came to be known as real property. Real actions were instituted by writs whose form was determined sometimes by the nature of the wrong which they were aimed to remedy, sometimes by the position of the plaintiff (as disseisee or heir of the disseisee), sometimes by the nature of the remedy sought (as in the case of the writ of right). The action of ejectment never took its place as a real action. The most comprehensive of the personal actions was trespass, to which were afterward added detinue, trover, and case. Later, under the developed common-law system of pleading, the term "personal action" was employed to denote any action available to enforce rights or redress wrongs, including actions to recover possession of personal property, but excluding actions to recover possession of, or involving rights in, real property.

Under the reformed system of procedure, which has come to prevail in England and many of the United States, the distinction between personal and real actions has lost its importance. See ACTION, FORMS OF ACTION; PLEADING.

PERSONAL EQUATION. See EQUATION, PERSONAL.

PERSONALITY. See INDIVIDUALITY, MENTAL CONSTITUTION, SELF.

PERSONALITY, DOUBLE OR MULTIPLE. See DOUBLE CONSCIOUSNESS.

PERSONAL PROPERTY; PERSONALTY.

In the common-law classification of property rights, those that, upon the death of the owner intestate, pass by operation of law to his personal representative, and not, as in the case of real property, to his heir. This classification of property as real and personal, though based fundamentally on the natural distinction between movables and immovables, is essentially artificial in character, having been developed under the pressure of social necessity. Thus, freehold interests in land, as the basis of the feudal system, passed at the death of the holder or "tenant" either to his lord, of whom the land was held, or to his heir, as the person presumably best fitted to discharge the obligations which land tenure involved. Leasehold estates, however, which developed later and which for social reasons were originally not held by free-men, were not based on tenure but on contract (covenant) and never secured recognition as feudal estates. Accordingly, on the death of such a tenant the unexpired term passed not to his heir but, as a "chattel real," to his personal representative. Certain other rights in land, such as the rights of merchant creditors under early statutes in the hand of their debtors, as well as the estate of a mortgagee in mortgaged land, have also been placed in the category of personal property. Generally, however, the term comprehends all, or nearly all, movable things—chattels, such as cattle, goods, wares, and merchandise, moneys, stock, bonds, and other securities, and certain forms of "incorporeal" property, such as patent rights, copyrights, the good will of a business, trade-marks, etc. As personal property is more easily transferable than real property and can more promptly and conveniently be subjected to levy and attachment in the interest of creditors, commercial considerations have in modern times determined the classification of various forms of property as personal which formerly would doubtless have been considered real. Indeed,

in some instances the classification of property, as shares of stock in railroad or in turnpike corporations, has been changed by judicial decision or by statute from real to personal. Property that is personal in its nature may become real by becoming affixed to real property, and in the same way real property may be converted into personal property by severance from the realty.

Title to personal property may be acquired in three ways: (1) by original acquisition, (2) by transfer by operation of law, (3) by transfer by act of the parties.

(1) Property acquired by original acquisition may be acquired: (a) by *occupancy* when one appropriates to his own use a thing which was not then subject to ownership, as in the finding and appropriation of lost property or the capture of wild animals; (b) by *accession*, which is the right which a person has to all the property which his own property produces, as the young of animals, and the right to all property which is annexed naturally or artificially to his own property; (c) by *confusion*, which is the inextricable commingling of other property with one's own property; (d) by *intellectual labor*, which is the source of the property right of authors and inventors in their writings and inventions.

(2) The transfer of the title to personal property by operation of law may be by forfeiture, by sale under execution, by operation of bankruptcy or insolvency laws, by exercise of the right of eminent domain, by marriage, by death of the owner, or by escheat.

(3) Transfer of title to personal property may be accomplished by act of the parties. At common law all that is necessary to transfer an interest in personal property from one to another is intent or mutual meeting of the minds of the parties without writing or other formality. (See CONTRACT; SALE; GIFT.) Modern statutes have made formalities requisite under some circumstances in order to protect the rights of the transferee from the claims of third persons.

For further information as to the various kinds of personal property, the methods of acquisition, and transfer of title thereto, the remedies for injury to personal property, etc., consult such subjects as ADMINISTRATION; CHATTEL; CHOSE IN ACTION; CRIME; DESCENT; EMBLEMENTS; ESTRAY; FERRE NATURE; FIXTURES; FRAUDS; STATUTE OF; LITERARY PROPERTY; MORTGAGE; PATENT; TORT; ETC.

Consult: Pollock and Wright, *Possession*; Schouler, *The Law of Personal Property* (3d ed., Boston, 1896); Brantley, *Principles of the Law of Personal Property* (San Francisco, 1890); Goodeve, *Modern Law of Personal Property* (4th ed., London, 1904); Williams, *Principles of the Law of Personal Property for the Use of Students in Conveyancing* (15th ed., London, 1900).

PERSONAL REPRESENTATIVE. In English and American law, the person who, as executor or administrator, administers the personal estate of a decedent. The term is sometimes employed in a more general sense to denote those who represent others in conducting transactions, as one acting under a power of attorney to vote stock, and also those who succeed to property by assignment, as the assignee of a lessee for years, and sometimes in wills to those who are technically called next of kin

(q.v.), according to the statute of distribution, and, in its broadest use, to all persons who stand in the place of another and represent his interests respecting his property, whether transferred to them by his act or by operation of law.

Primarily and usually, however, the term is used to designate only those persons in whom the personal estate of a decedent vests for the purpose of administering it. More nearly than the heir, upon whom the real estate of an intestate descends, the personal representative (executor or administrator) occupies the position of the Roman *heres*, and it is from the Roman, through the medium of the canon, law as administered in the ecclesiastical courts of England, that the conception of the personal representative in our legal system is derived. He was so called because he represented the *persona*, or individuality, of the deceased, whom by a kind of personification he represented for the purpose of discharging his obligations and carrying out his wishes with respect to his personal estate. However, unlike the *heres* in the earlier civil law, the personal representative was never held liable for any debts of the decedent, except to the extent of the assets received by him. Formerly he was entitled to any surplus of the estate that might remain in his hands after the payment of the debts and legacies, but this has long ceased to be the case, and he must now account for it to those entitled under the statutes of distribution. However, he is still something more than a mere official administrator, as the actual legal title to the personal estate vests in him and remains in him until he has paid it over to those who show themselves to be entitled thereto under the law. His duties and the method and form of his administration are usually particularly prescribed by statute. See ADMINISTRATION; DISTRIBUTION; EXECUTOR; ETC. Cf. HEIR; KIN, NEXT OF.

PERSONIFICATION (from Lat. *persona*, person + *facere*, to make). A figure of rhetoric by which inanimate objects or mere abstract conceptions are invested with the forms and attributes of conscious life. See METAPHOR; RHETORIC, FIGURES OF.

PERSONS, ROBERT. See PARSONS, ROBERT.

PERSEON, pār'sōn, CHRISTIAN HENDRIK (1755-1837). A Dutch physician and botanist, born at the Cape of Good Hope, Africa. He was educated in Holland and practiced his profession for a number of years in Germany. He went to Paris about 1802, where he published several interesting works on cryptogamic plants, also a *Synopsis of Plants* in two volumes. The titles of his principal works are: *Observationes Mycologicae* (1796); *Synopsis Methodica Fungorum* (1801); *Icones Pictæ Specierum Rariorum Fungorum* (1803-08); *Synopsis Plantarum* (2 vols., 1805-07). The Australasian genus *Perseonia* (Proteaceae) is named in his honor. It embraces about 60 species, some of which are valuable timber trees.

PERSPECTIVE (Fr. *perspective*, from Lat. *perspectus*, p.p. of *perspicere*, to see through, from *per*, through + *specere*, to see). The art of representing natural objects upon a plane surface in such manner that the representation shall affect the eye in the same way as the objects themselves. The distance and position of objects affect both their distinctness and apparent form, giving rise to a subdivision of perspective into linear and aerial perspective. The former is strictly scientific and a branch

of applied geometry and, as its name denotes, it considers exclusively the effect produced by the position and distance of the observer upon the apparent form and grouping of objects. Aerial perspective confines itself to the distinctness of objects as modified by distance and light, and belongs to the nonscientific sphere of pictorial representation.

Linear perspective in a picture is obtained as follows: after the scope (i.e., the number of objects to be introduced and the distance at which they are to be viewed) of the picture has been determined, and before the design is commenced, it is necessary to draw upon perspective plan three lines: (1) the base line or ground line, which limits the sketch towards the operator, and may be considered as the base line of an imaginary vertical plane called the picture plane. (2) The horizon line which represents the ordinary position of the sensible horizon. The height of the horizon line is about one-third of the height of the picture, when the sketcher is placed at or a little above the level of the horizon; but it may rise in a degree corresponding to his increase of elevation till it reaches near to the top of the perspective plan. The general rule is to have a high horizon line when the view is taken, or supposed to be taken, from an eminence, but when the station is on a

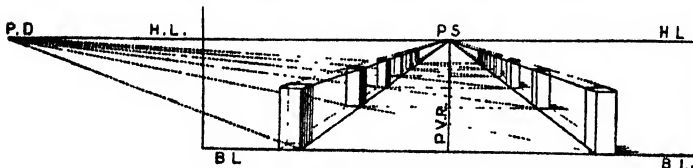


Fig. 1

Illustrating the more important points and lines. P.V.R. is the principal visual ray; P.D., point of distance; H.L., horizon line, B.L., base line, P.S., point of sight.

level, either actual or assumed, the horizontal line must be low. The horizon line in nearly all cases is supposed to be level with the spectator's eye. (3) The vertical line which is drawn from the supposed position of the sketcher, perpendicular to the ground and horizon lines, meeting the latter in a point which is called the point of sight or centre of the picture. The vertical line has no representative in nature

the picture; but we very frequently find it on the right or left side, though always, of course, on the horizontal line. All lines which in nature are perpendicular to the picture plane raised upon B.L. as a base, meet in the point of sight, which is thus their vanishing point. (See the line of the tops and bottoms of the pillars in Fig. 1.) The points of distance are two points in the horizontal line on each side of the point of sight, and in a direct sketch are at a distance from it equal to the horizontal distance of the sketcher's eye from the ground line. The equality of distance of these points from the point of sight is not, however, necessary, as it occurs only in those cases where the lines, of which the points of distance are the vanishing points, are inclined (in nature) at an angle of 45° to the base line, but in all cases the two points of distance are about twice as far apart as the eye is from the picture. One important use of the points of distance is to define the distance of objects in a row (Fig. 1) from each other. For this purpose two points of distance are not necessary, as, when the position of one pillar is found, that of the opposite is at once obtained by drawing a line parallel to the base or ground line.

There are many other groups of parallel lines in a picture which have different situations and therefore different vanishing points. Such lines with their vanishing points (called, for distinction's sake, accidental points) are represented in Fig. 2. If the accidental point is above the horizontal line, it is called the accidental point aerial; if below, the accidental point terrestrial; and a little consideration makes it evident that these points may or may not be situated within the plane of the picture. Such are the points and lines necessary for the construction of a plan in true perspective; and from the above explanation we may deduce the two general principles. (1) that all parallel straight lines in nature are no longer parallel when projected on the perspective plane, but meet in a point which is called

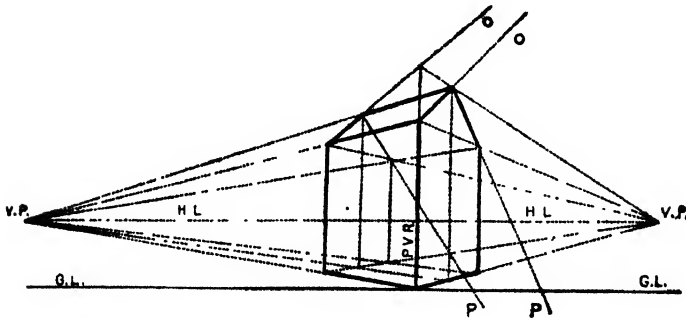


Fig. 2.

The lines OO_1 converge to the accidental point aerial and PP to the accidental point terrestrial. VP is the vanishing point; HL , horizon line, GL , ground or base line; PVR , principal visual ray.

and is merely a mechanical adjunct to the construction of the picture, all vertical lines in nature being parallel to it in the picture. The point of sight, being the point directly opposite to the observer, is often placed in the centre of

the vanishing point and is some one of the three above described, unless these lines happen to be also parallel to the ground line or the vertical line, in which case they remain parallel when transferred to the picture; and (2) that since the bodies drawn below the horizontal line are seen as if from above, those above as if from below, and those to the right and left of the point of sight as if observed from the left and right, it follows that straight lines which in the picture are above the horizontal line lower themselves, and those below raise themselves to it; those to the left, following the same law, direct themselves to the right and vice versa.

Besides the more usual angular perspective

there is the bird's-eye perspective, when the eye is taken up to an imaginary high level; curvilinear or panoramic perspective, in which the surface of projection is a concave cylinder; spherical perspective, in which the picture plane is replaced by a portion of a concave sphere and all the lines are arcs of great circles or meridians of the sphere, whose respective poles are the vanishing points; and oblique perspective, with its triple horizons and vanishing points.

Aërial perspective consists in a modulation of the brightness and colors of objects in accordance with the state of the atmosphere, the depth of the body in the perspective plane (i.e., distance in nature from the ground line), and other accidents of place and time. As the distance of objects increases their illuminated parts are made less brilliant and their shaded parts more feeble. The bluish tint imparted by a large mass of the atmosphere to the bodies seen through it is frequently imitated by the mixing of a slight tint of blue with the colors to be applied; a yellow object thus assumes a greenish tint, a red one a violet tint, etc. The air, when charged with vapor, is represented by a diminution of the brightness of colors and by the grayish tint imparted to them.

Sculptural perspective refers to the appearance of statuary and reliefs in elevated or distant positions, as in the pediments or metopes of temples, on the façades or spires of churches. The Greeks were consummate masters of this art which was not unknown to the Gothic stone masons, especially in France. Among Renaissance sculptors Donatello was the first to rediscover the art.

Architectural perspective is simply the application of linear perspective to architectural drawing and is a specialized branch of descriptive geometry. The plans, elevations, and sections by which buildings are represented in the working drawings are orthographic projections, which give the correct geometric and dimensional relations of the various parts of the building shown, but present in each case only two dimensions and do not exhibit the natural aspect of the structure as it appears to the eye from any given point of view. This deficiency is supplied by the perspectives, which show its appearance as seen from one or another point of view, all three dimensions being represented, but with the foreshortenings and angular distortions of its actual appearance from the given point. It is customary to make perspectives not merely of the exterior of a projected or executed building, but also of the more important interior portions. See **DRAWING**; **ISOMETRIC PERSPECTIVE**.

History. Knowledge of perspective in all its branches is comparatively modern. Oriental art knew nothing of any branch. A glance at Egyptian and Assyrian reliefs shows that the most elementary principles were ignored. Buildings and trees were laid flat on the ground or stood up in front view; the figures were placed one on top of the other instead of on different planes.

The Greeks first studied and solved some of the mysteries of linear perspective, but it is doubtful whether they ever got beyond the architectural form into the plastic and pictorial forms. This step was reserved for the more realistic art of the Alexandrian and especially the Roman age. The frescoes at Pompeii often exhibit an elaborate attempt to draw buildings

in perspective with varying degrees of unsuccess.

Renaissance art, however, attacked almost immediately the question of linear perspective in all its branches. The architect Brunelleschi laid the foundations of the science, and his theories were further developed in the writing of Leon Battista Alberti. Their maxims were applied to painting, particularly by the realists, Paolo Uccello and his associates. Piero della Francesca excelled in both the theory and practice of perspective and was the first in Italy to master aërial perspective. Consummate masters also were Melozzo da Forlì, Andrea Mantegna, and especially Correggio. See **FORESHORTENING**.

The problem of aërial perspective was first solved by the Netherlands of the early fifteenth century and it appears complete in the landscape backgrounds of the Van Eycks, from whom it passed as a heritage to the school. It was not mastered until 50 years later in Italy. Aërial perspective is particularly important in landscape painting. It was thoroughly understood by the classical as well as the naturalistic schools. (See **LANDSCAPE**.) Among modern painters Theodore Rousseau stands preëminent as a master of perspective.

Bibliography. Of the early treatises the most important are Leon Battista degli Alberti, *De Pictura Libri tres*, edited by H. Janitschek (Vienna, 1877), and Piero della Francesca, *De prospectiva pingendi* (Strassburg, 1899), both of which were first published in the latter part of the fifteenth century. The subject is very fully treated in W. R. Ware, *Modern Perspective* (rev. ed., New York, 1905). Consult also J. A. R. Maillard de la Gournerie, *Traité de perspective linéaire* (Paris, 1898). Gustav Seeberger, *Principien der Perspektive* (7th ed., Munich, 1900); U. Checa, *La perspective* (Paris, 1900); Robert Pratt, *Perspective, Including the Projection of Shadows and Reflections* (New York, 1901); W. H. Lawrence, *Principles of Architectural Perspective* (2d ed., Boston, 1904); G. A. Storey, *The Theory and Practice of Perspective* (Oxford, 1910); Louis Cloquet, *Traité de perspective pittoresque* (3 vols., Paris, 1913). B. J. Lubschez, *Perspective: An Elementary Textbook* (New York, 1913). See **DRAWING**, *Perspective Drawing*.

PERSPECTIVE. In mathematics, a term applied to figures, one of which is formed from another by a single central projection. Thus, if from a point S , exterior to two planes P and P' , a pencil of rays pass through the vertices of a triangle ABC situated in plane P , these rays meet P' in the vertices of a triangle $A'B'C'$ in perspective with the triangle ABC . In general, P cuts P' , and the line of intersection is called the axis of perspective, the point S being called the centre of perspective. If the planes P and P' are brought into coincidence, the triangles, or other figures similarly related, are still said to be in perspective. In two perspective figures a point or line of one corresponds to a unique point or line of the other, hence a curve and its projection are of the same order and the same class (see **CURVE**), e.g., a conic section is always projective, or in perspective with a conic section, although the species may not be the same. Many properties of perspective figures are demonstrated by means of the fundamental proposition: the anharmonic ratio (q.v.) of perspective ranges is constant. See **PROJECTION**.

PERSPECTIVE, CENTRE OF. See **CENTRE.**

PERSPECTIVE, ISOMETRIC. See **ISOMETRIC**

PERSPECTIVE.

PERSPECTIVE DRAWING. See **DRAWING.**

PERSPECTIVE PROJECTION. See **MAP.**

PERSPIRATION. See **SWEAT.**

PER STIR/PES (Lat., according to stocks).

See **PER CAPITA.**

PERTAB SINGH, pĕr-tăb' sîng, SĪR (1844-). An Indian soldier and statesman, grandson and successor of Maharaja Man Singh of Mahdauna. He was Chief Minister of Jodhpur in 1878-79, accompanied the British mission to Afghanistan in 1880, visited England in 1887, served in the Tirah and Momand expeditions in 1897-98, and was promoted to colonel. In 1900 he was a member of the relief force that marched to Peking. Pertab Singh became Maharajah of the State of Idar in 1901, but in 1911 abdicated to assume the regency of Jodhpur. When the European War broke out in 1914 he accompanied the Indian troops to France to join the British expeditionary army. He was knighted by Queen Victoria and received an LL.D. from Cambridge.

PERTH, pĕrth. The capital of Western Australia, situated on the north bank of the Swan River, 12 miles northeast of Fremantle, on the Eastern Railway. It is flanked on the east by the Darling Range and surrounded by picturesque scenery (Map: Western Australia, B 10). It is the see of Anglican and Roman Catholic bishops. The most notable public buildings are the Houses of Parliament, the Observatory, the Supreme Court House, the Royal Mint, the Stock Exchange, the administration offices, the Police, Civil, and Bankruptcy Court Houses, the Police Barracks, the Governor's residence, Government House, the Town Hall, the Gothic Anglican cathedral, Presbyterian, Wesleyan, and Congregational churches, the Post Office, the Hebrew synagogue and Mohammedan mosque, the Hospital, the Museum, the Victoria Jubilee Public Library, the Theatre Royal, the Bishop's palace, the Roman Catholic cathedral, the High School, the Alexander Scots' College, and the Queen's Hall. Among its several well-kept pleasure grounds the largest is Perth Park. A feature of the approach to the city from the southwestern seaport of Fremantle is the beautiful lakelike reach, the Perth Water. Perth has electric trams, the Queen's Gardens, the King's Park, Zoological Gardens, an Ascot race course, and a fine water supply. Pop. (est.), 1910, 55,000.

PERTH. The capital of Perthshire, Scotland, a city, royal and parliamentary burgh, on the Tay, 48 miles north-northwest of Edinburgh (Map: Scotland, E 3). The charming scenery of the immediate vicinity, the Tay, sweeping southward along its eastern side, and the superb background of the Grampians, on the north, render the site of the Fair City exceedingly beautiful; while the important rôle it has played as capital of the Scottish kings gives it high rank among the cities of Scotland. The river is spanned by two handsome bridges, and there are two beautiful public parks, called the North Inch and South Inch. Among the most interesting public buildings are the church of St. John (whence St. Johnstown, or St. John's Town, the old name of the city); the Episcopal cathedral of St. Ninian's; the county building; the town house, part of which was built in 1210; King James VI's Hospital; the infirmary;

and the city prison. At the head of the South Inch stands the General Prison of Scotland, where all criminals sentenced to imprisonment for long periods are confined. The town also contains a statue of Albert, Prince Consort, a public library, the museum of the Antiquarian Society, a natural-history museum, public seminaries, and other educational institutions. It manufactures linen, winceys, rope, cordage, chemicals, dyestuffs, and ink, and has shipbuilding yards, distilleries, and extensive bleaching fields. It is a good cattle and produce market, and the salmon fisheries on the Tay are very valuable. The total quaysage of Perth harbor is 1225 feet, and vessels of 200 tons can be accommodated. Perth has a charter as a royal burgh from King William the Lion (1165-1214). It was the scene of the murder of the Earl of Cornwall, by his brother Edward III, in 1336; of a combat between two Highland clans (1396), described in Scott's *Fair Maid of Perth*; of the assassination of James I in 1437, notwithstanding the heroic action of Catharine Douglas, who died to prevent the entry of the murderers by making her arm serve in place of the missing bar on the door; and of Knox's Reformation sermon. Pop., 1901, 32,872; 1911, 35,854. Consult Samuel Cowan, *The Ancient Capital of Scotland* (New York, 1904).

PERTH. The county seat of Lanark Co., Ontario, Canada, on the Tay River and the Canadian Pacific Railway, 48 miles southwest (direct) of Ottawa. It has a collegiate institute, municipal buildings, a public library, and athletic park. The industrial establishments include foundries and machine-shops and manufacturing of sashes and doors, aërated waters, felt, carpets, boots and shoes, and knit goods. Pop., 1901, 3588; 1911, 3588.

PERTH, FIVE ARTICLES OF. Articles forced upon the Church of Scotland by King James VI (James I of England) in his attempt to crush Scottish Presbyterianism. At the General Assembly at Perth, Aug. 25, 1618, the Bishop of St. Andrews presided, without election as moderator, dominated the assembly by the men at arms and threats of the King's displeasure, and forced, against great opposition, the acceptance of the five articles. These enjoined (1) kneeling at communion, (2) five holy days—Christmas, Good Friday, Easter, Ascension Day, and Whitsunday, (3) episcopal confirmation, (4) private baptism, (5) private communion. The King tried to enforce the articles, but the majority of the people revolted both from the prelatical customs and from the way they had been carried in assembly. In 1638 the King, alarmed at the spread of the Covenanters, forbade the enforcement of the articles, and the General Assembly in November of that year, meeting in Glasgow, abolished them, along with the Book of Canons, the Liturgy, and the Book of Ordination, as introduced without warrant of either civil or ecclesiastical authority. Consult: W. M. Hetherington, *History of the Church of Scotland* (Edinburgh, 1842); David Calderwood, *History of the Kirk of Scotland*, edited by Thomas Thomson, vol. vii (ib., 1845); P. H. Brown, *History of Scotland*, vol. ii (Cambridge, 1902).

PERTH AMBOY, ăm'boi or ăm'boi'. A city and port of entry in Middlesex Co., N. J., 15 miles south by west of Newark, on Raritan Bay, at the mouth of the Raritan River, and on the

Lehigh Valley, the Central of New Jersey, the Pennsylvania, and the Staten Island Rapid Transit railroads (Map: New Jersey, D 2). It has a fine harbor, which is now (1915) being improved with transportation facilities by water, and controls important shipping interests, particularly in coal. In 1913 Perth Amboy imported \$7,800,000 worth of merchandise, while its exports amounted to \$3,000,000. The manufactures, which are extensive, include terra cotta, bricks, chemicals, oil, cork, copper, iron, steel, and lumber, the first two named being developed from the valuable deposits of fire clay found in the vicinity. There are also two large smelting and refining plants and important shipbuilding interests. According to the thirteenth census, Perth Amboy produces annually \$73,000,000 worth of goods, representing an invested capital of \$25,000,000 and giving employment to about 6600 persons. The city-hall park, Carnegie library, city hospital, Washington's statue, and the bridge of the New Jersey Central Railroad are among the features of Perth Amboy. The government is administered, under a charter of 1871, by a mayor, elected every two years, and a council which has powers of election and confirmation in important administrative offices. The water works are owned and operated by the municipality. Pop., 1890, 9512; 1900, 17,699; 1910, 32,121; 1914 (U. S. est.), 38,265.

Perth Amboy was settled in 1683 and was expected soon to outstrip its neighbors and become the London of America. It was named Perth, after James, Earl of Perth, but Amboy, the original Indian name for the place, was soon added. It was the capital of the province from 1684 almost continuously up to the time of the Revolution. William Franklin, the last royal Governor, was captured here in 1776. Perth Amboy was incorporated as a city in 1718. Consult W. A. Whitehead, *Contributions to the Early History of Perth Amboy* (New York, 1856).

PERTHES, pâr'tás, FRIEDRICH CHRISTOPH (1772-1843). A German publisher and patriot. He was born at Rudolstadt. In his fifteenth year he was apprenticed to a Leipzig bookseller, with whom he remained six years. In 1793 he was employed by Hoffman, the Hamburg bookseller, and in 1796 started business on his own account and developed an important publishing business. The rule of the French in northern Germany, and the prohibition of intercourse with England, nearly ruined trade, yet Perthes found ways and means to extend his business. He endeavored to enlist the intellect of Germany on the side of patriotism, and in 1810 started the National Museum. Its success was far beyond Perthes's expectations, and encouraged him to continue his patriotic activity, till Hamburg was formally incorporated with the French Empire. He subsequently took a prominent part in the movement that forced the French garrison to evacuate Hamburg, March 12, 1813; and on its reoccupation by the French he was one of the 10 citizens who were specially excepted from pardon. In 1822 Perthes removed to Gotha, where he devoted himself to the publication of historical and theological works. He was the prime mover in the organization of the German book trade and in the foundation of a museum connected therewith. His correspondence with literary, political, and theological notables is extremely interesting and throws light upon the inner life of Germany early in the nine-

teenth century. Consult C. T. Perthes, *Life and Times of Friedrich Christoph Perthes* (Eng. trans., London, 1858).

PERTHITE. A red flesh-colored feldspar, consisting of interlaminated orthoclase and albite, that is found in Perth, Canada. It often affords bright aventurine reflections, and consequently is in some demand as a gem. See ORTHOCLASE.

PERTH'SHIRE. An east midland county of Scotland, bounded north by Inverness and Aberdeen, east by Forfar, Fife, and Kinross, south by Stirling and Clackmannan, and west by Argyll and Dumbarton (Map: Scotland, D and E 3). Area, 2493 square miles, largely highlands. The Grampian Mountains here reach altitudes of 3843 and 3984 feet respectively in Ben More and Ben Lawers. The lakes are numerous and include Lochs Tay, Erich, Katrine, and Achray. The entire region has been immortalized as the country of Scott's *Lady of the Lake*. The principal rivers are the Forth and the Tay. Old red sandstone, granite, and slate abound; in the lowland districts the soil is composed mostly of a rich loam, in which crops of all kinds are brought to perfection; only about one-fifth of the total area, however, is under cultivation. The highland districts are devoted chiefly to sheep pasturage and extensive deer forests. Stock raising is largely carried on. The chief industries are the manufacture of textiles, bleaching, and dyeing. Capital, Perth. Pop., 1901, 123,283; 1911, 124,342.

PERTINAX, PUBLIUS HELVIUS. Emperor of Rome. He was born, according to Dio Cassius, at Alba Pompeia, a Roman colony of Liguria, 126 A.D. He received a good education and, entering the military service, rose through the various grades till he obtained the command of the First Legion, at the head of which he signalized himself in Rhætia and Noricum against the native tribes. In 179 or, according to other authorities, in 172, he was chosen consul, aided in repressing the revolt of Avitus in Syria, and was governor successively of the provinces of Mœsia, Dacia, and Syria. He was sent by the Emperor Commodus to take the command of the turbulent legions in Britain, and these troops, against his will, proclaimed him Emperor; on which he solicited a recall, and was appointed proconsul of Africa, prefect of Rome, and consul (a second time) in 192. On the death of Commodus his assassins almost forced Pertinax to accept the purple, which with great hesitation he did (Jan. 1, 193), but, in spite of his promise of a large donation, he was unable to gain over the Prætorian Guard. His accession was, however, hailed with delight by the Senate and the people, who were rejoiced to have as ruler an able captain instead of a ferocious debauchee; and Pertinax, encouraged by this favorable reception, announced his intention of carrying out an extensive series of reforms, having reference chiefly to the army, in which he hoped to reestablish the ancient Roman discipline. Unfortunately, he was attacked by a band of the rebellious prætorians, about three months after his accession, and, disdaining to flee, was slain (March 28, 193). His head was carried about the streets of Rome in triumph.

PERTURBATIONS (Lat. *perturbatio*, confusion, from *perturbare*, to confuse, from *per*, through + *turbare*, to disturb, from *turba*, throng, tumult). In astronomy, a term used to

describe disturbances in the orbital motion of the planets or other celestial bodies. The simplest kind of motion imaginable under the law of gravitation would be that of a small material particle revolving about a larger central attracting body. If this particle is so small that its mass may be neglected altogether, as being inappreciable in comparison with that of the central body, then the particle will describe an elliptic orbit having the larger body in one of its foci. If, however, both bodies have masses so large that neither is negligible, then each body will describe an elliptic orbit having the common centre of gravity of the two bodies in the common focus, and its distance from either body will be inversely proportional to that body's mass. Thus the larger body will describe proportionally the smaller orbit. The problem of determining mathematically all the circumstances of motion in such a system is called the problem of two bodies, and its complete solution is possible. When the number of bodies in a system is increased to three we have the famous problem of three bodies, the complete mathematical solution of which has never been effected. It is not even certain whether our inability to solve this problem completely is due to the lack of sufficient power in the known methods of mathematical analysis or to the fact that the problem is actually insoluble. Fortunately, astronomers have been able to obtain an approximate solution of the problem as it actually exists in the solar system, and this approximate solution is sufficiently exact for all practical purposes of predicting planetary phenomena. This solution is made by taking advantage of the fact that all the planets in the solar system are very small in comparison with the central body, the sun. The effect of this is to make such planet describe an orbit very nearly the same as the elliptic curve in which it would move if that planet and the sun were the only bodies in the system. Consequently, astronomers can predict planetary phenomena on the assumption that the orbit is a true ellipse, and then calculate the small disturbances or perturbations produced by the gravitational attraction of the other planets in the system. The continuing action of perturbative attraction may in time produce certain changes in the size, shape, and position of an orbit.

The principal planetary perturbations are of several kinds: some change a planet's position on the sky alternately forward and backward every few years (periodic perturbations); others require a longer cycle to act forward and backward (long inequalities); and lastly there are the secular inequalities, whose effects are so slow that hundreds of thousands of years are included in their cyclic action. The planetary periodic perturbations may displace the planets as seen from the sun by 15" in the case of Mercury, 30" for Venus, 60" for the earth, and 120" for Mars. The most important long inequality is that existing between Jupiter and Saturn. It may displace the former planet 28' and the latter as much as 48'. The long-period secular inequalities do not alter either the mean distances of the planets from the sun or their periods of revolution. But the nodes (see NODE) and perihelia of the orbits move continuously. The perihelia of all the planets except Venus are gradually increasing their celestial longitudes, and all the nodes are moving in the opposite direction on the ecliptic. At

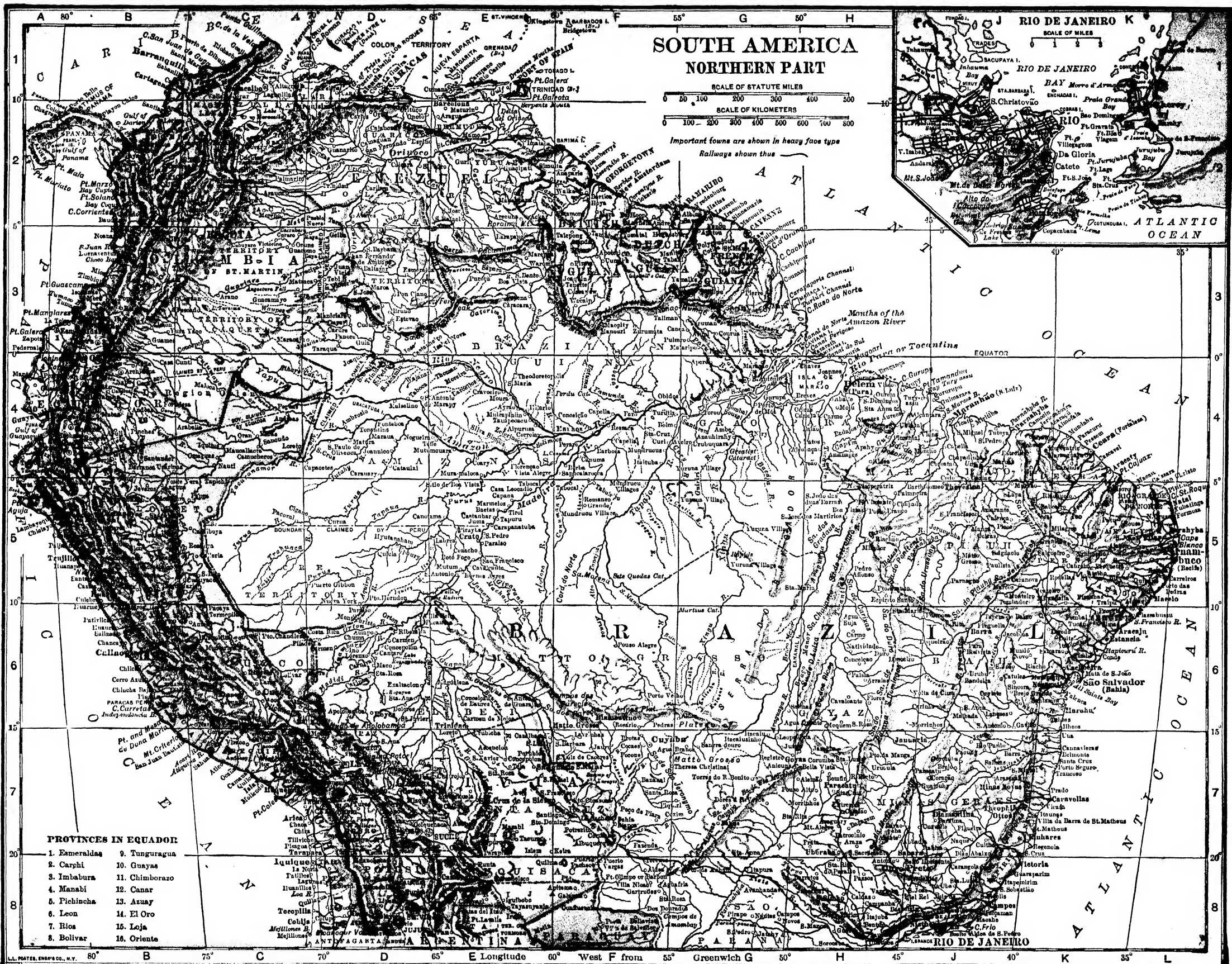
the same time the inclinations of the planetary orbits to the ecliptic plane are oscillating through narrow limits in very long periods of time and the eccentricities are similarly affected. But, on the whole, the mathematical researches so far made indicate that the continued effect of gravitational perturbative action will not end in the disruption of our solar system. But its permanent existence might be jeopardized by other than gravitational forces, or by forces operating from outside the system. In the case of the moon perturbations are more complex and larger than they are in the planetary orbits. The moon is so near us that the slightest error in her predicted position is observed with ease and certainty, and therefore her motion offers a much severer test to mathematical calculations than do the planetary phenomena. Consult F. F. Tisserand, *Traité de mécanique céleste* (4 vols., Paris, 1889-96). See MOON.

PERTUS/SIS. See WHOOPING COUGH.

PERTY, pâr'tê, JOSEPH ANTON MAXIMILIAN (1804-84). A German zoölogist and philosophical writer, born at Ohrbau in Middle Franconia. He studied medicine and natural history at Landshut and Munich, in 1833 became a professor in the University of Bern, and subsequently was made rector. His principal works are: *Allgemeine Naturgeschichte als Philosophische und Humanitätswissenschaft* (1837-44); *Die mystischen Erscheinungen der menschlichen Natur* (1861; 2d ed., 1872); *Ueber das Seelenleben der Tiere* (1869; 2d ed., 1875); *Blicke in das verborgene Leben des Menschengesistes* (1869); *Die Anthropologie als die Wissenschaft* (1873-74); *Erinnerungen aus dem Leben eines Natur- und Seelenforschers des 19. Jahrhunderts* (1879).

PERTZ, pèrts, GEORG HEINRICH (1795-1876). A German historian. He was born at Hanover, studied at Göttingen, and at 24 published an authoritative *Geschichte der merowingischen Hausmeier* (1819). Four years afterward Pertz was appointed secretary of the royal archives of Hanover and began his important research in mediæval German history as editor of the *Monumenta Germaniæ Historica*. Most of the materials for the Carolingian period were edited personally by Pertz, and an account of his travels and preliminary research was published in the *Archiv der Gesellschaft für ältere deutsche Geschichtskunde* (1824 et seq.). He resigned his post as editor in 1874. Pertz had become librarian and keeper of the Hanoverian archives in 1827, royal librarian in Berlin in 1842, and wrote biographies of Stein (1849-54) and of Count von Gneisenau (1864-69). With Grotefend he edited Leibnitz's works (1843-47). Consult article in *Allgemeine deutsche Biographie*, vol. xxv (Leipzig, 1887).

PERU, pè-rōō' (corrupted from *Biru*, name of a chief of the early sixteenth century, who ruled a small territory of South America near the Isthmus of Darien). One of the four countries of South America bordering on the Pacific Ocean. It is bounded on the north by Ecuador, on the east by Brazil and Bolivia, on the south by Bolivia and Chile, and on the west by the Pacific Ocean. Its frontiers on the north, east, and south cannot be exactly defined throughout their whole extent on account of boundary disputes with Ecuador, Bolivia, Chile, Brazil, and Colombia, most of which are in process of settlement. The coast line, however, is not affected by these disputes except for a comparatively



SOUTH AMERICA
NORTHERN PART

SCALE OF STATUTE MILES
0 50 100 200 300 400 500
SCALE OF KILOMETERS
0 100 200 300 400 500 600 700 800

Important towns are shown in heavy face type
Railways shown thus



- PROVINCES IN EQUADOR
- | | |
|---------------|----------------|
| 1. Esmeraldas | 9. Tungurahua |
| 2. Carpi | 10. Guayas |
| 3. Imbabura | 11. Chimborazo |
| 4. Manabi | 12. Canar |
| 5. Pichincha | 13. Azuay |
| 6. Leon | 14. El Oro |
| 7. Rios | 15. Loja |
| 8. Bolivar | 16. Oriente |

short distance in the extreme south. The area is estimated by the Lima Geographical Society at 683,335 square miles, but other estimates give as low as 439,014 square miles. The length of the coast line conceded to belong to Peru is about 1100 miles, not reckoning sinuosities.

Topography. Extending north and south through Peru are three well-marked topographic divisions: the Coast Desert, the region of the Andes, and the Montaña or tropical forested plain east of the Cordilleras and included in the basin of the Amazon. The *Zona seca* (dry zone) extends along the Pacific coast from lat. 3° S. (south Ecuador) through Peru to lat. 22° S. in north Chile. Most of this sandy desert is only 20 miles in width, but in the north it is 120 miles wide. It gradually rises from the Pacific to nearly 1000 feet, where it merges with the foothills of the Andes. It is destitute of vegetation except where crossed at intervals by rivers, which rise among the snow tops of the Andes. The banks and valleys of these roughly parallel streams are covered with perpetual vegetation, ribbons of green among the desert waste. Here are many estates and plantations. The desert is whitish in color, owing to the large admixture of marine shells. On the sea margin steep cliffs generally rise, and the waste behind them is slightly undulating, with ridges of considerable height rising here and there. The surface is hard, excepting near the coast, where drifting sea sands are whirled aloft by the winds in clouds of dust. The coast is fairly supplied with harbors well sheltered from the sea, but at many small ports the ships of the coasting trade roll uncomfortably in open roadsteads. The bays of Paita, Sechura, Chimbote, Callao, Samanco, and Norato are secure land-locked havens, where the largest vessels may find shelter.

The region of the Andes is about 250 miles in width. It contains enormous chains of mountains, between which are elevated plains and table-lands, warm and fertile ravines and valleys. The mountain system consists of three Cordilleras extending from northwest to southeast, more or less parallel with the line of the coast. The two western chains, for long distances comparatively near each other, are identical in origin and have been separated by denudations in the course of many ages. On these Maritime and Central Cordilleras are the volcanoes and many thermal springs. Some peaks of the maritime range rise to a height of 15,000 feet. The Sierra, a name that is not applied to any particular cordillera in Peru, designates the region between the maritime and central ranges, rising from 4000 feet, where it abuts on the western, to 10,000 feet at the central mountains. This region, from 50 to 150 miles wide, is a high, broken plain, corresponding to the temperate zone of Mexico, and is best adapted for settlement by whites of the temperate zones. The central range, with culminating peaks 19,000 feet above the sea, is for the most part a distinct water parting between the Atlantic and Pacific drainage systems, though a few Pacific streams rise to the east of this line of summits. Between the central range and the Eastern Cordillera is the Puna (signifying "hard breathing"), a broken plain rising from 9000 feet at its west edge to 14,000 feet at the edge of the great Eastern Cordillera of the Andes, where several of the grandest mountains of the continent are found, some of them over-

looking the northern plain of Bolivia, rising 20,000 feet. On the Puna rise a number of the great southern headwaters of the Amazon. The Peruvian Andes increase in height from north to south and from west to east.

The eastern part of Peru drops steeply from the Cordilleras to the plain of the upper Amazon, called the Montaña, 800 miles in length, covered with subtropical forests, where it joins the mountains, and with dense tropical vegetation on the plain, which is cut by the eastern frontier. The Montaña is very rich in rubber and agricultural resources, with abundant navigation, and promises to be one of the most prosperous parts of Peru, though it has yet reached only the early stages of development.

Hydrography. The dry west and the rainy east of Peru naturally produce a striking contrast between the hydrographic aspects of the west and east slopes of the country. There are over 40 streams flowing into the Pacific, all torrential in character, small of volume, and fed by the snows of the Cordilleras. The most important is the Santa, which rises, not on the west slopes of the mountains, like most of the coast rivers, but in a long valley between the maritime and central ranges. During the flood the Santa discharges such an enormous quantity of water that it is difficult to cross. Most of the coast rivers are quite short, and their great value is derived wholly from the facilities they afford, by means of irrigation, for turning belts of the desert into the most fertile of lands. The more important among them, from north to south, are the Chira, the Piura, the Santa, the Rimac, which created the fertile plain on which Lima stands, and the Río Grande.

The Amazonian affluents of the east slope, on the other hand, constantly increase in volume with distance from their sources. The rivulets among them carry more water than most of the Pacific streams. The upper parts of these rivers are interrupted by cascades and rapids, and thus the economic periphery of east Peru is largely determined by the line joining the heads of navigation on these many rivers. All the very numerous rivers of the east slope of Peru are included in the Amazon basin and belong to one or another of the secondary basins of the Marañón, the Huallaga, and the Ucayali (these three are entirely in Peruvian territory), the Purus, the Madre de Dios, and the Madeira. The Marañón is usually regarded as the main upper branch of the Amazon, not because it carries so much water as the Ucayali, but because it prolongs farthest towards the Pacific the longitudinal axis of the Amazon. Ocean steamers now regularly ascend the Amazon and Marañón to Iquitos, Peru, 2500 miles from the Atlantic, and light-draft steamers prolong navigation for 825 miles up the Ucayali and Pachitea rivers. The most important lake is Titicaca (q.v.), which lies partly in Bolivia; it is 12,500 feet above sea level and affords navigation between Peruvian and Bolivian ports on its shores. Junín and many other small lakes are found in the plateau region.

Climate. The chief determining influences on the climate are the trade winds and the great differences in elevation. The country is more temperate than might be expected from its position in the tropics. The trade winds coming west from the Atlantic deluge the eastern mountains, drop cold rain and snow upon the Puna, give a smaller supply of water to the central

range, and moisten the plain of the Sierra to some extent. So little water is left for the maritime range that it is included with the coastal desert in the dry belt. These facts explain the aridity of the west slope of Peru. Once in seven or eight years a marvelous change comes over the face of this desert. Sufficient rain comes over the mountains to bring life out of the parched surface; grass and flowering plants appear, attracting thousands of cattle and goats from the irrigated valleys to the new pasturage, which withers again in a few weeks. Only about $1\frac{1}{2}$ inches of rain fall in Lima in a year. The mean annual temperature of the coast provinces is 68° F. In the hottest months, January and February, the mean temperature is between 82° F. and 86° F. The dry heat is not oppressive, and after 11 A.M., when the torrid sun has rarefied the atmosphere over the desert, sea air comes rushing to this area of low pressure, all life is refreshed by the breeze, and often a little rain is scattered over the maritime range. In the evening, when the surface of the desert grows cool, the wind sets to sea again, bringing cool breezes from the mountains. Conditions are nowhere unhealthful excepting in the low, hot plains of the north and east. The whole mountain region lying between 3000 and 9000 feet above the sea has a temperate and healthful climate.

Flora. Varying with the climate, the flora of Peru is represented on the dry coast only by a few gray herbs and in the depressions by the *Prosopis*, a low tree of scraggy growth, and two shrubs, the *Capparis* and a variety of *Apocynum*. The west slopes of the maritime range, exposed to fogs and occasional rains, have sufficient vegetation to give them a green aspect mixed with yellow due to the abundance of yellow marguerites. The high plateaus among the mountains have a great variety of species, among which resinous and other herbs and the gigantic cactus are especially abundant, and several varieties of forest trees are found. The flora of every zone is represented among the mountains, from the tropical in the deep gorges to the Arctic approaching the snow line. The potato thrives, and the llama, vicuña, and sheep feed on the grasses of the uplands. The most valuable plants economically are the quinine-yielding cinchona; the coca plant, from which cocaine is derived, the *Siphocampylus*, a plant 50 feet high, from which Peruvian rubber is extracted, and the sarsaparilla.

Fauna. The headlands of the coast and the neighboring islands are the home of myriads of sea birds, whence came the immense deposits of guano that were long a great source of Peruvian wealth. Among them are the guano bird (*Sula variegata*), a large gull (*Larus modestus*), a tern (*Sterna inca*), and several cormorants. Sea lions (*Otaria forsteri*) are common on the promontories and islands. The domesticated llama and alpaca and the wild vicuña belong especially to the mountain regions; among the other animals of the highlands are the taruco, a deer, the viscacha, a large rodent, the atoc, a species of fox, the puma, and two species of bear. The largest bird is the condor; another bird of the vulture family, whose black and white wing feather was used by the Incas in their headdress, is the coraquenque. Woodpeckers, a species of partridge, geese, a plover, two kinds of ibis, gulls, water hens, finches, and parrots are also found. Nearly all the char-

acteristic animals of tropical South America are found in the Montaña, including monkeys, the tiger cat, jaguar, tapir, peccary, tortoise, alligator, manatee, vipers, and other snakes.

Geology and Mineral Resources. Sections of the desert zone, exposed along the coast and valleys for several hundred feet, reveal nearly horizontal layers of calcareous sandstone above strata of pudding stone and shell marl, beneath which are beds of argillaceous shale, considerably tilted and often of immense thickness. The ridges found on the coast plain are of granite or syenite. The Maritime and Central Cordilleras consist chiefly of crystalline and volcanic rocks on each side of which are sedimentary strata, principally of Jurassic age. The Eastern Cordillera is in great part of Silurian formation, with talcose and clay slates, many quartz veins, and intrusions of granite rocks. The igneous cones of Peru are found in the southern section of the maritime and central ranges, about 1200 miles south of those in Ecuador. None of them has been in eruption in recent times. Sara-Sara, Achatayhua, Coro Puna, Ampato (all over 13,000 feet), Chachani (19,820 feet), and Misti (about 20,000 feet) are quiescent and snow-clad. Misti, a magnificent cone, near whose base stands the city of Arequipa, appears to be the focus from which some of the earthquakes that afflict Peru have been propagated. South of Misti is the elongated crest of the volcano of Omate, in the seventeenth century the most active of the Peruvian volcanoes. Farther south is Tutupaca (18,960 feet), which as late as 1862 was still ejecting vapors by which a little sulphur was deposited. The frequent and severe earthquakes are most destructive in the neighborhood of these southern volcanoes. In 1746 Callao and in 1868 Arequipa were destroyed by earthquakes. The shocks of 1877 were equally severe, and all the southern ports were overwhelmed by earthquake waves.

Peru is a vast storehouse of mineral wealth, though it long ago lost the first rank as a mining country, and its mineral output is now far surpassed in value by the tin of Bolivia and the nitrate of Chile. The Eastern Cordillera contains gold in the quartz veins of the Silurian strata, but the annual yield is small because the richest mines occur in the most unhealthful and remote parts of the Montaña. The Central and Maritime Cordilleras are poor in gold, but rich in silver, which occurs nearly always with antimony, copper, and lead. Copper is found in great abundance. On the coast lands are important areas of salt, borax, and petroleum (in Piura). Anthracite and bituminous coal are reported in the Hualgayoc district and are known to exist in the Huamachuco and other districts. Copper has superseded silver as the most valuable mineral product. The principal centre of both silver and copper mining is the Cerro de Pasco district, which produced \$475,000,000 of silver between 1630 and 1849. Other important silver-mining centres are those around Puno and at Caylloma, Castrovirena, and Recuay. American and British companies are largely interested in the mining industry. The number of mines has greatly increased of late. The value of the total mineral production during 1905 was \$7,960,000, the value of the leading products being as follows: silver, \$3,152,500; copper, \$3,027,000; gold, \$472,000; crude petroleum, \$604,000; coal, \$478,000. The

output of petroleum in 1913 was 1,857,355 barrels. In 1912 the output of copper was valued at \$9,825,000; silver, \$5,153,000. The output of fine copper in 1912 was about 27,840 metric tons and in 1913 about 27,940 tons. Extensive and valuable guano deposits occur on islands off the coast.

Agriculture. The chief crops of the fertile coast valleys are sugar, cotton, and coffee. Sugar and cotton are the great export crops and form the basis of agricultural prosperity. The unoccupied land capable of producing sugar is measurable only by the possibilities of irrigation, which is being extended. In 1911 and 1912 respectively the reported sugar output was 178,533 and 192,754 metric tons. Cotton is indigenous, and that grown in the northern provinces is distinctive (tree cotton), the plant often reaching a height of 20 feet and producing for 7 to 10 years, the fibre ranging in color from pure white to dark brown. This cotton is especially valued for mixing with fine wool, to which it adds strength, lustre, and protection against shrinkage. Its value is greater than that of any other cotton excepting American sea island. The ordinary staple grown in the coast valleys farther south is adapted for spinning fine yarns. Extensive irrigation works both north and south are now being developed to enlarge the area of cotton culture, and the product is steadily increasing. The reported cotton output in 1913 was 52,345,000 pounds. Rice and tobacco are important crops, and there are several large establishments for the preparation of rice for market. Maize and alfalfa, vegetables, and fruits of all kinds are cultivated in every valley. Grape culture is increasing, and the production of wine is important. Olives are grown in the south, and there are many profitable grazing farms in the coast valleys. In the valleys and to some extent on the plateaus of the Andean region wheat and barley ripen, the potato is a very successful crop, and the cultivation of coffee is a growing industry. The cultivation of the cacao tree is especially successful in the valley of the Pénen River in the Montaña. Rubber is shipped from the Montaña, whose other chief products are cinchona, dyes, and medicinal substances, all the exports going down the Amazon from Iquitos. The coca tree thrives best near the Pacific in the Department of La Libertad.

Manufactures. There are woolen mills at Lima and Cuzco, making blankets, army uniforms, and undergarments. Callao and its suburbs have many factories, chiefly of cigarettes, chocolate, petroleum oils, candles, soap, etc. Wine making is an important industry of the country, and there are a number of flour and lumber mills, and furniture factories. Sugar is produced in considerable quantities from the cane and cocaine from the coca plant. The Indians of the north make fine straw hats, which enter the trade as Panamas. Indians on the mountain plateaus make coarse woolen fabrics and earthenware for local consumption. A few coast towns produce filigree and other fancy articles. The quantity of petroleum refined is increasing. Owing to the small variety and quantity of home manufactures, it is necessary to import a great deal of machinery and wares of all kinds.

Commerce. Peru's business relations with foreign countries have increased notably in recent years. The following table shows the value

of imports and exports, in libras (the libra is equal to the pound sterling, \$4.8665):

	1908	1910	1911	1912	1913
Imports:					
5,311,973	4,980,697	5,438,247	5,140,339	6,088,776	
Exports:					
5,478,941	7,074,076	7,416,028	9,438,571	9,187,780	

The larger classified imports in 1910 and 1913 respectively were as follows in thousands of libras: tools, machinery, vehicles, and ships' stores, 184 and 923; comestibles, 734 and 753; metals and metal manufactures, 449 and 726; cotton textiles and manufactures, 588 and 688; stone, earth, coal, glass, etc., 122 and 510; paints, dyes, gums, etc., 80 and 364; wool and manufactures, 213 and 302; drugs, etc., 113 and 212.

The total mineral export in 1909 is reported at 1,663,424 libras; in 1910, 1,922,460; in 1912, 2,212,000. The export of copper and silver bars in 1910 were valued at 1,236,694 libras; in 1911, 1,210,903. The principal nonmetallic exports have been as follows, in thousands of libras:

EXPORTS	1910	1911	1912	1913
Cotton	1,015	1,028	1,043	1,424
Sugar	1,382	1,225	1,394	1,380
Rubber	1,279	612	1,308	816
Wool, alpaca		214	213	323
Hides	91	108	127	191
Wool, sheep	145	106	146	170
Wool, llama	71	85	26	161
Straw hats	121	441	433	119
Cottonseed	22	22	39	106
Rice	46	82	59	78

In the sugar trade Peru has the great advantage that the fields are cheaply irrigated and the absence of rain permits grinding for three-fourths of the year. Raw sugar is therefore produced at small cost. About five-sixths of the crop is exported, Great Britain, the United States, and Chile being the largest buyers. The distinctive qualities of Peruvian cotton create a demand for it in the leading woolen centres of the United States and Europe. Coffee exports are not expanding, because most of the plantations are on the Andes slopes and transportation by mule train to the railroads is very expensive.

Imports and exports by principal countries are reported as follows, in thousands of dollars:

COUNTRIES	Imports		Exports	
	1910	1913	1910	1913
United States	4,484	8,531	9,878	14,742
United Kingdom	8,158	7,769	12,234	16,539
Germany	3,843	5,132	1,741	2,967
Belgium	1,218	1,867	816	1,213
France	2,361	1,363	3,751	1,568
Italy	815	1,237	5	8
Chile	740	1,036	4,524	6,047
Bolivia			970	640

Imports and exports by principal ports in 1913, in thousands of libras: Callao, 3891 and 3907; Iquitos, 387 and 763; Mollendo, 581 and 1105; Salaverry, 479 and 924; Paita, 315 and 1202; Eten, 204 and 365; Pisco, 136 and 663.

The trade with the United States for 13 years was as follows: exports from Peru in 1900, \$4,774,480; 1905, \$3,657,000; 1913, \$8,-

542,000; and imports into Peru: 1900, \$1,487,180; 1905, \$3,153,000; 1913, \$14,761,000.

Transportation and Communications. Foreign vessels call at nearly all the seaports, the chief of which is Callao. The vessels entering that port in 1912 numbered 562, of 1,387,919 tons. About one-half of the tonnage of foreign vessels was British. The steamships of the Pacific Steam Navigation Company, on the route between Chile and San Francisco, call at nearly all the Peruvian ports. Very little freight is carried in domestic bottoms, the merchant marine of the country in 1911 consisting of only 11 steamers, of 12,673 tons net, and 60 sailing vessels (over 50 tons), of 31,453 tons.

Good wagon roads and bridges are among Peru's greatest needs. Western Peru is still almost isolated from the Montafia because the road on which a vast sum has been spent to connect Oroya, the terminus of the Central Railroad with the Pichis River, the head of navigation leading to Iquitos, is not yet in a satisfactory condition. The railway between Oroya and the great mining centre of Cerro de Pasco, 68 miles, is now open for traffic.

Peru in 1912 had 1719 miles of railway in operation, of which 1150 miles were worked by the Peruvian Corporation, which manages all the property turned over in liquidation of the national debt. Not only Lima, but also the larger inland towns are connected by rail with their seaports, but the country needs branches extending north and south to connect the Andean towns with the routes to the sea and with one another. Peru thus has numerous sections of a railroad system, but owing to the lack of branches between them the railroads are as yet wholly inadequate for the needs of the country. The greatest railroads are the line from Callao and Lima across the Maritime and Central Cordilleras to Oroya, 138 miles, with many tunnels, enormous bridges, embankments, and cuttings; and the railroad between the port of Mollendo and Puno on Lake Titicaca, on which there is a connection by steamers with Bolivia. The Oroya Railway, begun in 1869, reaches an elevation of 15,665 feet, where the divide is crossed through the Galera Tunnel, at mile 106 from Callao. The Morococha branch attains an elevation of 15,865 feet, the highest railway point in the world. At Oroya the road divides, one branch going north to the Cerro de Pasco copper mines, and the other 80 miles south to Huancayo. Still another branch, which will be some 300 miles long when completed, is under construction to the head of navigation on the Ucayali River, an important upper tributary of the Amazon. From Huancayo an extension is planned to Cuzco, which has rail connection with Mollendo. Telegraphs in 1915: lines, 16,800 kilometers; offices, 340, mostly in control of the state. There is a radiotelegraphic system, with stations at Iquitos, Putamayo, Requena, Orellana, Masisea, Puerto Bermúdez, Callao, Lima, Pisco, Chala, and Ilo. Post offices in 1915, 800. Electric communication with the rest of the world is supplied by the cables along the coast, with stations at Paita, Callao, Lima, Barranco, and Mollendo.

Banking. The commercial banks of Peru include the Bank of Peru and London (paid-up capital, 500,000 libras); the Italian Bank (capital, 200,000 libras); the International Bank of Peru (capital, 100,000 libras); and the Banco Popular del Peru (capital, 150,000 libras). The

only savings bank has deposits amounting to over 200,000 libras.

Education. The free public-school system has been under the control of the national government since 1905, but on account of financial stress was abandoned temporarily to the municipalities in 1914. Elementary education is nominally compulsory, but apparently the majority of children do not attend school, and illiteracy is prevalent. Public primary schools in 1913 are reported at 2253, with 3063 teachers, with an enrollment of about 150,000. In 1911 there were 27 national *colegios* (secondary schools), with an enrollment of 4674 students, of whom 2077 were in preparatory courses. There are also numerous private schools of various grades, and several institutions for technical or special instruction. At Lima is the University of San Marcos, founded in 1551, with faculties of law, medicine, theology, philosophy and letters, mathematics and science, and political and administrative science. There are other universities, at Arequipa, Cuzco, and Trujillo. Lima has a notable public library.

Religion. The religion of the state is Roman Catholic, and the constitution prohibits the public exercise of any other religion; practically, however, there is considerable toleration, and Callao, Lima, and Cuzco have Protestant churches and missionary schools. The non-Catholic population probably does not number over 30,000.

Finance. Although the country is possessed of sources of great wealth, Peruvian finance presents in large part a disastrous history, owing to war and mismanagement. Revenue and expenditure for 1910 amounted to 2,795,775 and 2,685,322 libras respectively; for 1912, 3,425,543 and 3,493,629; estimates for 1914, 3,547,836 and 3,109,836. The estimated revenue for 1914 was made up as follows: customs, 1,505,112 libras; taxes, 730,428; monopolies (including salt), 740,728; posts and telegraphs, 166,720; miscellaneous, 404,848. The estimated departmental expenditures were: finance and commerce, 888,224 libras; war and marine, 832,386; administration, 510,613; justice and public instruction, 481,345; public works, 200,511; legislature, 107,943; foreign affairs, 88,814.

In 1870 and 1872 Peru contracted in England two loans, amounting to \$32,688,320. Including interest arrears, the debt in 1889 stood at \$55,209,133. In 1890 Peru was released of responsibility for this debt, the bondholders forming themselves into the Peruvian Corporation, to which was ceded for 66 years the state railways and certain rights over guano deposits, mines, and immense tracts of land. The terms of the contract were not carried out by either party, and in 1907 another agreement was signed, whereby the government engaged to pay the corporation £80,000 annually for 30 years, and the corporation undertook to proceed with railway construction. Various matters were reserved for subsequent arrangement.

In 1913 the foreign debt, contracted in 1911, amounted to £1,162,700; internal debt, £2,660,645 at 1 per cent and £1,132,210 without interest; floating debt, £5,392,457.

Money, Weights and Measures. Peru adopted the gold standard in 1901. Both the pound sterling and the national gold coin, the libra, which is of the same standard and weight, are legal tender. The par value of the libra is \$4.8665. The silver sol is one-tenth of a

libra; silver is legal tender up to 100 sols. In 1914 issues of paper money were made, which on account of the financial situation at once depreciated in value. Spanish standards of weight and measure are still in use, though the metric system was established by law in 1860 and is employed in the customhouses.

Population. There has been no census since 1876, when the population was given at 2,660,881, of whom about 13.8 per cent were white, 1.9 negro, 57.6 Indian, 24.8 mestizo, and 1.9 Asiatic, chiefly Chinese. To all appearances the population is increasing very slowly, if at all. Immigration from Europe, which is promoted by the Peruvian Corporation, is very small.

The list of departments, with their approximate area, capitals, and population (estimated in 1915), is given as follows:

DEPARTMENTS AND PROVINCES	Square miles	Population	Capital
Amazonas	13,940	53,000	Chachapoyas
Ancachs	16,562	317,000	Huáras
Apurímac	8,187	133,000	Abancay
Arequipa	21,947	172,000	Arequipa
Ayacucho	13,185	227,000	Ayacucho
Cajamarca	12,540	333,300	Cajamarca
Callao*	14½	35,000	Callao
Cuzco	89,447	300,000	Cuzco
Huancavelica	9,250	167,840	Huancavelica
Huánuco	14,024	109,000	Huánuco
Ica	8,713	68,200	Ica
Junín	23,350	305,700	Cerro de Pasco
Lambayeque	4,614	93,000	Chilclayo
Libertad (La)	10,206	188,000	Trujillo
Lima	13,310	250,000	Lima
Loreto	172,059	120,000	Iquitos
Madre de Dios	25,500	16,000	Maldonado
Moquegua*	5,550	32,000	Moquegua
Piura	16,825	155,000	Piura
Puno	27,979	270,000	Puno
San Martín	30,745	33,000	Moyabamba
Tacna†	1,990	8,000	Tumbes
Tumbes*	1,990	8,000	Tumbes
Total	544,404½	3,386,040	

* Provinces.

† Disputed with Chile.

Government. For political purposes the Republic of Peru is divided into 19 departments and 3 provinces, and these departments in turn are subdivided into 104 provinces. The present constitution, based on that of the United States, was proclaimed in 1856 and revised four years later. Under it the executive power is vested in a President, who must be 35 years of age and a native Peruvian, elected by direct vote for four years, and two Vice Presidents elected for the same period. The President is ineligible for two consecutive terms. He is assisted by six responsible ministers, who hold office at his pleasure, but whose signature is necessary to validate his acts.

The legislative power is vested in a Senate of 52 members and a Chamber of Deputies of 116. The Senators, with the same age and residence qualifications as the President, are elected by departments, the number varying from one to four, according to the number of provinces in the department. The Deputies, Peruvians by birth and citizens of good standing, are elected in the proportion of one for every 30,000 inhabitants or majority fraction, though each province is entitled to one representative even if its population is less than 15,000. Senators must have an annual income of 1000 sols (£100), and Deputies of 500 sols (£50), or have a scientific profession. They are elected by direct vote for six years.

The judicial power is vested in a supreme court of justice, whose members are elected by Congress from names submitted by the President; superior courts in each department, whose members are appointed by the President; and judges of first instance in each province and local justices in each municipality, appointed by the judges of the superior courts. The conduct of all trials must be public. The executive and police powers of the Republic depend directly upon the President, who appoints the prefects of the various departments and the sub-prefects, who control the provinces. All police officials hold directly from the President. Citizenship is restricted by educational and property qualifications. The capital of the Republic is Lima.

Army and Navy. Service is universal and compulsory, three years being spent in the active or first-line army, 12 years in the two reserves, and 15 years in the militia, or a total of 30 years' liability. Total peace establishment: five battalions of infantry, seven squadrons of cavalry, six batteries of artillery, amounting to between 6000 and 6500 men in all. Arms: Infantry, Mauser rifle; cavalry, Mauser carbine. For purposes of military administration there are five territorial districts. In addition to the peace army there is a police force of approximately the same strength, viz., 2413 civil guards, 1900 mounted police, 1905 dismounted police.

History. Little is clearly ascertainable regarding the early history of the Peruvian Empire, and the lists given of its early sovereigns are by no means to be trusted. Almost all we know of their early history is derived from the traditions of the people, collected by the early Spaniards. (See PERUVIAN ARCHÆOLOGY.) In 1453 Tupac Inca Yupanqui, the eleventh Inca according to the list given by Laso de la Vega (q.v.), greatly enlarged his widespread dominions. He led his armies southward into Chile, marched over the terrible desert of Atacama, and, penetrating as far south as the river Maule, fixed there the southern boundary of Peru. While thus engaged, his son, the young Huayna Capac (q.v.), heir to the fame as well as the throne of his father, had marched northward to the Amazon, crossed that barrier, and conquered the Kingdom of Quito. In 1483 Huayna Capac ascended the throne, and under him the Empire of the Incas attained its greatest extent, his sway extending from the valley of the Amazon to Chile and from the shores of the Pacific to the sources of the Paraguay.

About the year 1516, and 10 years before the death of Huayna Capac, the first white man had landed on the west shores of South America, but it was not till the year 1531 that Pizarro (q.v.), at the head of a small band of Spanish adventurers, actually invaded Peru. Before his death the great Inca had expressed a wish that the Kingdom of Quito should pass to Atahualpa (q.v.), one of his sons by a princess of Quito, and that all his other territories should fall to his legitimate son, Huascar, the heir to the crown, and who, according to the custom of the Incas, should have inherited all its dependencies. Between these two princes quarrels resulting in war arose, and when Pizarro entered Peru he found the country occupied by two rival factions. Atahualpa had completely defeated the forces of his brother, had taken Huascar prisoner, and was now stationed at

Caxamarca, on the eastern side of the Andes, whither, with a force of 102 foot soldiers and 62 horsemen and two small falconets or cannon, the dauntless Spanish leader, in September, 1532, set out to meet him. A large ransom in gold was secured for Atahualpa, but instead of being released he was executed for his refusal to accept the Christian faith (August, 1533). Increased by reinforcements to about 500 men, of whom a third were cavalry, the Spaniards started for Cuzco. They entered the Peruvian capital, Nov. 15, 1533, having in the course of their progress towards the city of the Incas had many sharp encounters with the Indians, in all of which their armor, artillery, and cavalry gave them the advantage. At Cuzco they obtained a vast amount of gold, one of the objects for which the conquest of Peru was undertaken. As at Caxamarca, the articles of gold were for the most part melted down into ingots and divided among the band. After stripping the palaces and temples of their treasures Pizarro placed Manco, a son of the great Huayna Capac, on the throne of the Incas. Leaving a garrison in the capital, he then marched west to the seacoast, with the intention of building a town from which he could the more easily repel invasion from without and which should be the future capital of the Kingdom. Choosing the banks of the river Rimac, he founded, about 6 miles from its mouth, the Ciudad de los Reyes (city of the kings). Subsequently its name was changed to Lima, the modified form of the name of the river on which it was placed. The Inca Manco succeeded in effecting his escape and headed a formidable rising of the natives. Gathering around Cuzco in immense numbers, the natives laid siege to the city and set it on fire. The city was relieved by the failure of provisions among the besiegers and the departure of the Peruvians for their farms. The advantages—many, though unimportant—which the Inca gained in the course of this siege were his last triumphs. He afterward retired to the mountains, where he soon after perished. More formidable, however, to Pizarro than any rising of the natives was the quarrel between himself and Almagro (q.v.), a soldier of generous disposition but of fiery temper, who, after Pizarro, held the highest rank among the conquerors. Civil war ensued, in which Almagro was defeated and put to death. His followers, however, plotted revenge, and in 1541 Pizarro fell beneath their swords. The son of Almagro then proclaimed himself Governor, but was soon defeated in battle and put to death. In 1542 a council at Valladolid in Spain, called at the instigation of the ecclesiastic Las Casas, who deplored the cruelties committed on the natives, framed a code of laws, known as the "New Laws for the Indies," for Mexico and Peru, according to which the Indians who had been enslaved by the Spaniards were virtually declared free men. It was also enacted that the Indians were not to be forced to labor in unhealthful localities and that whenever they were desired to work in any particular locality they were to be fairly paid. Blasco Nuñez Vela, the first Viceroy of Peru, was sent from Spain to enforce the new laws. He rendered himself unpopular and was seized and sent back to Panama. The Audiencia, consisting of four judges, which had come with the Viceroy, now undertook the government. Gonzalo Pizarro (q.v.), who was already in re-

volt, now marched on Lima and was recognized as Governor by the Audiencia. Pizarro was overthrown by Pedro de la Gasca and put to death in 1548.

With the arrival of the Viceroy Antonio de Mendoza (1551) the rule of Spain was definitely established in Peru. For nearly two centuries after this date the destiny of the viceroyalty was presided over by the viceroys sent from Spain, who succeeded one another in most orderly fashion. Some of these administrators were very able, as Francisco de Toledo (1569-81), who issued many useful laws for the Kingdom; many were of average ability, while some were utterly incompetent. In all 41 Spanish viceroys held office in Peru. There were often conflicts between the civil and ecclesiastical officials or between the Viceroy and the Audiencia, and then charges and countercharges were made to the Council of Indies and the crown, but often years intervened before the matter was settled. The University of San Marcos in Lima, the oldest of the New World, was founded in 1551, and in 1569 the Inquisition was established to carry on its work of extirpating heresy. The Dominicans, Franciscans, Augustines, Mercedarios, and Jesuits established convents in Peru, labored for the conversion of the Indians, conducted the education of the people, and wrote regarding the life and languages of the natives. The Jesuits were expelled in 1767. The question of the treatment of the Indians was perennial. Many laws and orders were issued for their protection, but the rapacity and cruelty of lesser officials, so far from the central government, could not always be controlled, and consequently the natives suffered many hardships. Finally, in 1780, the tranquillity of the province was broken by an Indian revolt led by Tupac Amaru, a descendant of the Incas, who promised his people relief from the oppressive *mita* and other abuses of the Spaniards and endeavored to reestablish the throne of his ancestors. Successful at first, the revolt was crushed, and Tupac Amaru and the members of his family were condemned and executed in a most brutal manner. During most of the colonial period the jurisdiction of the Viceroyalty of Peru extended over the whole of Spanish South America. In 1718 the Viceroyalty of New Granada was formed (later suppressed and reestablished in 1739) of the region now occupied by Venezuela, Colombia, and Ecuador, and in 1776 most of the present Argentina, Bolivia, Paraguay, and Uruguay was detached, and made into the Viceroyalty of Río de la Plata. Spain contributed much to Peru—civilized jurisprudence, religion, domestic animals, and many grains and fruits. On the other hand, Europe received from Peru the potato, maize, and quinine. During the Spanish régime the country enjoyed much prosperity; mining and agriculture were especially developed. The viceroys were enabled to remit many thousands of dollars to Spain for the support of the crown.

Peru took no part in the earlier movement for independence in Spanish America. In July, 1816, when the Viceroy José Fernando Abascal turned over his office to his successor, Joaquín de la Pezuela, there was a Spanish army of 23,000 men in Peru and all resistance had apparently been stamped out in Chile, Upper Peru (Bolivia), Quito, and New Granada, Buenos Aires alone maintaining her independ-

ence. Peru was the last of the Spanish South American possessions to set up the standard of independence. In August, 1820, an army under General San Martín (q.v.), one of the liberators of Chile, landed at Lima, and after a number of successes both on sea and land, in which the patriots were effectively assisted by Lord Cochrane, General Miller, and other English volunteers, the independence of the country was proclaimed at Lima, July 28, 1821. San Martín assumed the protectorate of the young Republic. By the spring of 1822 he had forced the surrender of the last large body of Spanish troops. At this juncture General Bolívar (q.v.), flushed with his successes in the north, landed at Guayaquil. San Martín, recognizing the dangers of rivalry, arranged a meeting on July 26, 1822, the details of which were never made public, but as a result of which San Martín resigned and, a year later, retired to England. A Congress was summoned, and on Feb. 28, 1823, José de la Riva Agüero was installed as the first President of Peru. Meanwhile the scattered bands of Spanish Royalists had managed to collect in the south, around Cuzco, and the agents of Bolívar succeeded in persuading the Congress to depose Riva Agüero. On Sept. 1, 1823, Bolívar landed at Callao and devoted himself to organizing an army. On Feb. 10, 1824, he was appointed Supreme Dictator by the Congress. For a while the Royalists under Canterac made considerable headway, occupying Callao Castle and forcing Bolívar to evacuate Lima. The two armies met on the plains of Junín, where a remarkable battle was fought in which the Peruvian cavalry turned defeat into victory by repeated charges with their lances. The Spaniards retired to Cuzco, where the Viceroy, La Serna, concentrated his forces for a final stand. On December 9 a battle was fought at Ayacucho in which the patriots, under General Sucre, were completely successful, and the Spanish officials and generals, with over 3000 soldiers, surrendered. The guerrilla fighting continued for a while in the north, where General Olafeta stubbornly held out until shot by his own troops in April, 1825. In 1826 the Spaniards evacuated Callao, and the war was at an end. Bolívar, on Feb. 10, 1825, resigned the dictatorship, but was immediately reappointed and remained in control of the government until March, 1827, when he returned to Colombia with his soldiers. On June 4, 1827, a congress met and framed a provisional constitution, adopted in 1828. General Lamar was elected president. Lamar promptly forced a quarrel with Bolívar, who declared war and defeated him, enforcing a money indemnity and the surrender of Guayaquil. The history of the next 35 years is the record of repeated changes in government, one man after another gaining a personal ascendancy, lasting a few days or years, until some rival took advantage of his mistakes to supplant him. Withal, the state of the country gradually improved, commercially, socially, and intellectually, but with few events of especial interest or importance.

In April, 1864, a Spanish squadron seized the Chincha Islands in reparation for injuries sustained by Spanish subjects. President Pezet was unwilling to risk a war with Spain, and a treaty of peace was signed in January, 1865. The action of the President aroused bitter opposition in the country; he was declared a traitor by the Assembly, and in February a revolution

broke out which ended in the overthrow of Pezet and the proclamation of Mariano Ignacio Prado as Dictator (Nov. 26, 1865). An alliance against Spain was concluded with Chile, Ecuador, and Bolivia, war being declared in January, 1866. On May 2, 1866, a Spanish fleet bombarded Callao, but was compelled to withdraw. This marked the termination of hostilities. In 1879 Peru as the ally of Bolivia became involved in war with Chile. (See BOLIVIA; CHILE.) In October, 1879, the Peruvian man-of-war *Huascar* was captured by the Chilean fleet, and on November 19 the forces of Bolivia and Peru were overwhelmed at Dolores. A Chilean army under General Baquedano captured Moquegua and Tacna, two important cities in south Peru, in March and May, 1880. Early in June the same general carried the almost impregnable stronghold of Arica by storm, thus gaining possession of the whole of south Peru. In the meantime the Chilean fleet was blockading or pillaging the North Peruvian seaports. The Peruvians refusing to accede to the terms for peace dictated by Chile, Baquedano organized an expedition against Lima. This expedition started in November, by water, and landed at Pisco and Curayaco, about 200 miles south of Lima. With an army 30,000 strong, the Chilean general marched on the capital, spreading devastation along the way. The Peruvians were defeated at Chorrillos on Jan. 13, 1881, and at Miraflores on January 15, and on January 17 the Chileans made their entry into Lima. Capt. Patrick Lynch, the leader in a raid which had devastated the northern coast towns, was appointed Chilean commandant of the town. After the fall of Lima desultory fighting continued until a treaty of peace was concluded at Ancón, Oct. 20, 1883. Peru ceded to Chile the District of Tarapacá and the territories of Tacna and Arica for a term of 10 years; the people of these territories to decide by popular vote whether they wished to return to Peru or to remain under Chilean rule. At the close of the 10 years Chile apparently distrusted the result of the plebiscite, and the matter was allowed to drag on. The question has not yet been settled, and is still a source of irritation in the relations of the two countries, although Peru has made numerous efforts to secure an adjustment.

The war left Peru in an exhausted and bankrupt condition, from which the process of recovery was slow. Civil war added to the difficulties, but in 1884-85 a successful revolt occurred which placed Gen. Andrés Cáceres (1886-90) in the presidency. The foreign debt weighed heavily on the country, but in 1890 a scheme for the cancellation of the debt was worked out. By the agreement the foreign bondholders took over the national railways, with certain guano rights, mining privileges, and land grants, while Peru was relieved of her indebtedness. The Peruvian Corporation was formed in London to carry out this contract. At the close of the administration of Col. Morales Bermúdez (1890-94) a civil struggle took place between General Cáceres and Nicolás de Pierola, in which the latter was successful and was elected President for the term 1895-99. Presidents Eduardo de Romaña (1899-1903), Manuel Candamo (1903-04, who died in office), José Pardo (1904-08), and Augusto Leguía (1908-12) quietly assumed and laid down the office. Minor revolts occurred in 1899 and 1909, but they were quickly suppressed.

Each of these executives labored to improve the conditions of the country, and notable progress was achieved in many directions. In 1906 President Pardo revoked the decrees which allowed the improper exploitation of the natural resources. With respect to foreign relations the principal problem has been that of the boundaries, some of which have been adjusted, while others are still pending. The revelations regarding the Putumayo atrocities, which occurred in the Peruvian Amazon region, stirred the world in 1912, and the United States and England urged upon Peru that she take measures to remedy the abuses.

In 1912 Guillermo Billinghurst became President. His friendly attitude towards Chile, his endeavor to weed out corrupt political practices, and his disregard of certain political elements brought on a revolt (Feb. 4, 1914), which resulted in his overthrow and exile. Col. Oscar Benevides assumed the provisional presidency and undertook to continue constitutional government. This political change had little effect upon the economic prosperity, but the outbreak of the European War produced serious disturbances. The government resorted to the issue of paper money, which caused further unsettled financial conditions. In 1915 Dr. José Pardo was elected President.

Bibliography. Description and travel: Antonio de Ulloa, *A Voyage to South America*, translated from original Spanish by John Adams (5th ed., 2 vols., London, 1807); W. L. Herndon, *Exploration of the Valley of the Amazon* (2 vols., Washington, 1853-54); M. T. Fajardo, *Tratado de geografía física política y descriptiva de la república peruana* (Lima, 1861); E. Grandidier, *Voyage dans l'Amérique du Sud, Pérou et Bolivie* (Paris, 1861); M. F. Paz Soldán, *Geografía del Perú* (ib., 1862); T. J. Hutchinson, *Two Years in Peru, with Explorations of its Antiquities* (London, 1873); Antonio Raimondi, *El Perú* (Lima, 1874-76); Emile Carrey, *Le Pérou* (Paris, 1875); E. G. Squier, *Peru: Incidents of Travel and Exploration in the Land of the Incas* (London, 1877); M. F. Paz Soldán, *Diccionario geográfico estadístico del Perú* (Lima, 1879); E. W. Middendorf, *Peru* (3 vols., Berlin, 1893-95); "Biblioteca peruana," in *Biblioteca del Instituto Nacional* (Santiago, 1896); Cisneros and García, *Geografía comercial de la América del Sud* (Lima, 1897); id., *El Perú en Europa* (ib., 1900); J. B. Moore, *Brazil and Peru Boundary Question* (New York, 1904); Alexander Garland, *Peru in 1906* (Lima, 1907); M. R. Wright, *The Old and the New Peru* (Philadelphia, 1908); Robert Spruce, *Notes of a Botanist on the Amazon and Andes . . . Being Records of Travel . . . in 1849-1864*, edited by A. R. Wallace (2 vols., London, 1908); C. R. Enock, *Andes and the Amazon: Life and Travels in Peru* (New York, 1910); A. S. Peck, *A Search for the Ape of America* (ib., 1911); C. W. Currier, *Lands of the Southern Cross* (Washington, 1911); P. F. Martin, *Peru of the Twentieth Century* (New York, 1911); Algot Lange, *In the Amazon Jungle* (ib., 1912); Lewis Spence, *Myths of Mexico and Peru* (ib., 1913); E. C. Vivian, *Peru* (ib., 1914); Millicent Todd, *Peru: A Land of Contrasts* (Boston, 1914).

History: M. A. Fuentes (ed.), *Memorias de los virreyes que han gobernado el Perú* (Lima, 1859); Manuel de Odróizola, *Documentos históricos del Perú* (10 vols., ib., 1863-77); Garcilaso de la Vega (the Inca), *Royal Commenta-*

ries, translated by C. R. Markham for the Hakluyt Society (2 vols., London, 1869-71); M. de Mendiburu, *Diccionario histórico biográfico del Perú* (eight vols., Lima, 1874-90); C. R. Markham, *The War between Peru and Chile, 1879-81* (London, 1883); id., *History of Peru* (Chicago, 1892); M. N. Vargas, *Historia del Perú independiente* (5 vols., Lima, 1903-12); R. E. Anderson, *Story of Ancient Civilizations of the West* (New York, 1904); Pedro Sarmiento de Gamboa, *History of the Incas*, translated by C. R. Markham for the Hakluyt Society (Cambridge, 1907); Francisco García Calderón, *Le Pérou contemporain: Etude sociale* (Paris, 1907); C. R. Enock, *Peru: Its Former and Present Civilization* (New York, 1908); W. H. Prescott, *Conquest of Peru*, in Everyman's Library (ib., 1909); Geraldine Guinness, *Peru: Its History, People, and Religion* (ib., 1909); C. R. Markham, *The Incas of Peru* (ib., 1910); C. E. Akers, *History of South America, 1854-1904* (new ed., ib., 1912); W. H. Prescott, *Conquerors of Peru* (new ed., ib., 1913); *The South American Yearbook* (London); Pan American Union, *General Descriptive Data* (Washington, 1915).

PERU. A city in Lasalle Co., Ill., 61 miles north-northeast of Peoria, at the head of navigation on the Illinois River, on the Illinois and Michigan Canal, and on the Chicago, Rock Island, and Pacific, the Chicago, Ottawa, and Peoria, and the Chicago, Burlington, and Quincy railroads (Map: Illinois, F 3). It has a public square and public parks and is the seat of St. Bede College (Roman Catholic), opened in 1891. Among the prominent buildings are Turner Hall, the Masonic Temple, the Carnegie library, People's Hospital, and the German library. There are four bridges here, including a fine railroad bridge. Peru is the centre of valuable bituminous coal fields and of extensive deposits of cement rock and white sand rock. Its industrial establishments include large zinc-rolling mills and furnaces, a foundry and machine shop, scale works, plow and wheel works, clock works, breweries, nickeloid works, a planing mill, a metal weather-strip factory, and novelty works. The government is administered under a charter of 1890, by a mayor, elected every two years, and a council. The water works and the electric-light plant are owned and operated by the municipality. Peru was first settled in 1827 and laid out in 1834. In 1851 it was chartered as a city. For the archaeologist the vicinity presents much interest, as there are relics of the Mound Builders. Pop., 1900, 6863; 1910, 7984.

PERU. A city and the county seat of Miami Co., Ind., 74 miles north of Indianapolis, on the Wabash River and on the Wabash, the Lake Erie and Western, and the Chesapeake and Ohio of Indiana railroads (Map: Indiana, E 3). The city has a public library, a city hospital, and two sanatoria. It derives considerable trade from the tributary country, which is largely agricultural. There are railroad shops of three systems, brass and steel foundries, bagging mills, carbon works, and manufactories of automobiles, gas engines, furniture, pianos, cabinets, refrigerators, wagons, etc. Peru, incorporated in 1848, is now governed under a charter of 1868 which provides for a mayor, elected biennially, and a council. There are municipal water works and a municipal electric-light plant. Pop., 1900, 8463; 1910, 10,910; 1915 (U. S. est.), 12,280.

PERU BALSAM. See BALSAM.

PERUGIA, pà-rŭ-jà. The capital of the Province of Perugia, Italy, situated on picturesque hills between the Tiber and Lago Trasimeno, at an altitude of 1617 feet above the sea, 103 miles by rail southeast of Florence (Map: Italy, D 3). Its situation is beautiful, offering delightful views of the Umbrian and Foligno valleys and of the Tiber and the Apennines. The town is inclosed by walls, and its mediæval appearance is attractive and interesting. It has many striking edifices dating from its glorious days at the beginning of the Renaissance period, and numerous art treasures, but is not so much frequented as Orvieto and Siena, with their famous cathedrals.

Perugia is irregularly laid out. Many of its substructures belong to the ancient Etruscan town. It possesses ample squares and pleasant grounds. The Gothic cathedral of San Lorenzo is not very striking, although of the Renaissance period. The most valuable of its varied contents is Signorelli's "Madonna with John the Baptist." Its library possesses ancient and costly manuscripts. The Oratorio di San Bernardino has a sculptured, multicolored early Renaissance façade (1457-61). The San Domenico (1304) is a fine Gothic church which has been attributed to Giovanni Pisano; it was rebuilt in 1614 and contains the elaborate and celebrated monument to Benedict XI. The Basilica San Pietro de' Cassinensi in the vicinity was founded about 1000 on the site of a sixth-century building; it contains noteworthy pictures by Perugino, Caravaggio, and others and has rich choir stalls (1535) in walnut. The notable old secular edifices of Perugia include the fine Cambio (the old exchange), with its celebrated mural paintings of the Chief Virtues by Perugino—his finest fresco—and other artistic features, all in the best Renaissance. The immense Palazzo del Municipio (dating from 1281, but not completed till 1443) is in Italian Gothic, with two façades. It has been latterly restored and is elaborately embellished with ancient sculptures, etc. Under its roof are the Vannucci picture gallery (municipal), a valuable collection of ancient Umbrian works taken from suppressed religious institutions, some of the churches, etc., and the public library, with over 70,000 volumes and some rare mediæval manuscripts. The finest section of the picture gallery is the Sala del Pinturicchio, with examples by Perugino and Pinturicchio. The college of San Severo is a notable ancient building, formerly a cloister. Here Raphael, who had been a pupil of Perugino, painted his first fresco in 1505. It is now in a spoiled condition. Among the attractive modern buildings are the arcaded Perfettura. In the centre of the modern city is a fine bronze equestrian statue of Victor Emmanuel II. Perugia has also a bronze statue of Julius III, a monument to Garibaldi, and a monument to the soldiers who fell for freedom in 1859. There are, besides, the beautiful Maggiore fountain (1277-80), bearing reliefs by Niccola and Giovanni Pisano; the striking Roman Arch of Augustus, constructed in the third century, and still one of the gateways of the city; and the house where Perugino dwelt.

The famous "free" University of Perugia, founded in 1320 and now much less important than formerly, has two faculties, law and medicine, the latter including pharmacy and veterinary science. In 1912 the students numbered only 278. Its library possesses 54,000 volumes.

In addition there may be mentioned an art-history collection and a botanical garden, and the valuable university collection of Etruscan, Roman, and mediæval antiquities. There are in the city a lyceum, a Gymnasium, a technical school, a technical institute, a seminary, an academy of fine arts, and an agricultural institution. A large orphan asylum is the chief charitable institution. There are manufactures of silk goods, velvet, and spirits. In the commerce figure chiefly grain, wine, and oil. Three miles southeast of the city lies the Etruscan necropolis of Perugia, discovered in 1840, with remarkable tombs including the sepulchre of the Volumnii. Pop. (commune), 1901, 61,385 (town, 20,580); 1906, 65,527 (22,321); 1911, 65,805.

Perugia (anciently called *Perusia*) was one of the 12 important Etruscan League cities. It became Roman in 309 B.C. In 41-40 B.C. it was unsuccessfully held by the partisans of Lucius Antonius against Octavianus (Augustus). It was destroyed by Octavianus and then rebuilt by him. It was again destroyed by Totila the Goth after a siege of seven years, about the middle of the sixth century. In the ninth century it fell under the dominion of the popes, but it afterward enjoyed a long period of independence and at the close of the Middle Ages ruled Umbria. About the middle of the sixteenth century it was incorporated in the Papal States. It passed to the Sardinians in 1860 and became a part of the new Kingdom of Italy. Consult: G. B. Vermiglioli, *De monumenti di Perugia etrusca e romana* (3 vols., Perugia, 1855-70); J. W. and A. M. Cruickshank, *The Umbrian Towns*, vol. ii (London, 1901); William Heywood, *History of Perugia* (New York, 1910); E. H. and E. W. Blashfield, *Italian Cities* (ib., 1912); Symonds and Duff-Gordon, *The Story of Perugia*, in "Medieval Towns Series" (London, 1912), containing a bibliography.

PERUGIA, LAKE OF. A lake in Italy. See TRASIMENO, LAKE.

PERUGINO, pà-rŭ-jè-nò, PIETRO, properly PIETRO VANNUCCI (1446-1523). An Italian painter, chief master of Umbria during the earlier Renaissance. Born at Città della Pieve, a mountain town near Chiusi, Perugino was the natural heir of the traditions of the Umbrian school, the leading note of which was the atmosphere of sentiment and mystic poetry, which found its best expression in the portrayal of the ideals of devotional art. His early paintings indicate Fiorenzo di Lorenzo as his master, although Buonfigli and Niccolò da Foligno have likewise been credited with his tutelage. According to Vasari, Perugino completed his studies under Verrocchio at Florence, which seems likely, in view of the influence of Verrocchio on his work. Though already independent in style, his early pictures reveal the influence of these and other contemporaries, in such works as the "St. Sebastian" (a fresco at Cerqueto), the "Crucifixion" (Uffizi and St. Petersburg), and the "Pieta" (Academy, Florence). His middle period, that of his most ambitious works, begins about 1481 with his frescoes in the Sistine Chapel, Rome, where he painted in rivalry with Botticelli (q.v.) and other great contemporaries of Florence and Umbria. Of Perugino's frescoes, three were afterward destroyed to make way for Michelangelo's "Last Judgment"; but a fourth, the "Delivery of the Keys to St. Peter," is, from a decorative point of view, the best of the entire series. Among other remarkable works of

his middle period are the "Entombment" (1495), Pitti Palace; the "Crucifixion" (1493-96); a fine fresco in Santa Maddalena dei Pazzi, Florence, and the "Madonna with Two Archangels," National Gallery, London.

His last period (c.1496-1524) was of great production but of declining artistic merit. Perugia, to which he returned definitely in 1506, was largely the centre of his activities. He made much use of his pupils in the execution and repetition of his pictures. His most extensive decoration comprised the frescoes of the Cambio (Merchant's Exchange) in Perugia (1500-04), in which allegories are depicted as female figures, along with antique heroes, lawgivers, prophets, and with sacred subjects—charming in color and neat in execution, but hardly atoning for lack of vigor by a superabundance of sentimentality. Although his latest works, like the "Triumph of Chastity" (Louvre), painted for Isabella d'Este's celebrated chamber in Mantua (see MANTEGNA, ANDREA), show decline, there are notable exceptions, like the frescoes of the Collegiata, Spello. Among the best of his altarpieces not mentioned in the above lists are the "Virgin Enthroned" (1496), in the Vatican; the "Annunciation" (1487), Fano; "Crucifixion," "Gethsemane," and "Assumption" (1500), all from Vallombrosa, but now in the Florence Academy; "The Vision of St. Bernard" at Munich; a triptych in Villa Albani, Rome; "Apollo and Marsyas" (attributed to Raphael) and three others in the Louvre. The celebrated "Marriage of the Virgin," at Caen, is now generally considered a work of Lo Spagna (q.v.). The collections and churches are especially rich in his works. His ability in portraiture is shown by the heads of two monks of Vallombrosa in the Academy, Florence, the beautiful portrait of a lady and that of Francesco dell'Opera in the Uffizi, and the fresco portrait of himself in the Cambio, Perugia.

The mediæval ideal of the Umbrian school finds in Perugino's works its most complete expression. He created the ideal type of the Madonna, pietistic yet of classic refinement, which found its consummation in Raphael. The deep religious sentiment of his figures is expressed not only in the figures themselves but in the landscape background, which reveals a consummate mastery of space composition. His color is rich and mellow, often suffused with a summery golden tone; but notwithstanding his Florentine training his work is usually deficient in form and movement. Despite the piety of his pictures he was reputed an atheist and immoral—with what truth it is impossible now to say. He died of the plague at Castello di Fontignano.

Bibliography. Braghirolli, *Notizie e documenti inediti intorno a Pietro Vannucci detto il Perugino* (Perugia, 1874); *Masters in Art*, vol. iii (Boston, 1902), containing an exhaustive bibliography; G. C. Williamson, *Perugino Vannucci, called Perugino*, in "Great Masters in Painting and Sculpture" (London, 1903); Kenyon Cox, in *Old Masters and New* (New York, 1905); Fritz Knapp, *Perugino*, in "Künstler-Monographien," No. 87 (Bielefeld, 1907); Edward Hutton, *Perugino* (new ed., London, 1911); Selwyn Brinton, *Perugino* (New York, 1912).

PERUVIAN ANTIQUITIES. See **PERUVIAN ARCHEOLOGY.**

PERUVIAN ARCHEOLOGY. At the

time of the Conquest the Empire of the Incas comprised the present countries of Ecuador, Peru, Bolivia, and that part of Chile north of the Maule River. Long before the time of the Incas the country had seen at least one powerful Empire arise and attain great skill in the arts. The stupendous and elaborate remains at Tiahuanaco are the most familiar example of the work of these ancient people. As other evidences of the great antiquity of man in this region may be cited the sun circle of Sillustani and structures that are almost the counterparts of Stonehenge and Carnac, to which is assigned the remotest place in monumental history.

Of the peoples who immediately preceded the Incas in this region but little is definitely known, being mostly derived from such works as they have left behind them.

In Ecuador there seem to have been several centres of culture—one by the people inhabiting the Province of Imbabura. In the region about Quito were the Caras, near Riobamba the Puruhas, about Cuenca and Cañar the Cañaris, and still others in Manabí and Esmeraldas.

Among the many peoples or tribes of Peru and Bolivia the most important were the Quichua (Kechua), the Aymara, and the Yunca. The last was a general name for the peoples of the coast valleys. Sir Clements R. Markham, an eminent authority, says: "The dawn of history found Peru broken up into many independent *ayllus*, or tribes composed of families of the same lineage. The Incas, Quichuas, Allcovichas inhabited the valleys around Cuzco. Collas, Lupacas, and Urus occupied the basin of Lake Titicaca. The powerful nation of Chancas dominated in the valleys from the Apurimac to Cerro Pasco, with the subordinate Pocras, Huancas, Soras, and Lucanas, and the Chinchas on the coast." Northern Chile was inhabited by a people of Araucanian affinities.

The Incas were originally a warlike tribe living in the great central plateau of the Andes. They had domesticated the llama, which they used as a beast of burden, and could thus transport arms and supplies to considerable distances—which was a great advantage to them in their wars. One region after another, either voluntarily or by conquest, came under their sway, until the Inca Empire extended along the Pacific from about the second degree north to the thirty-seventh degree of south latitude.

The social structure of Peru was not unlike that of the more primitive tribes to the north. There was a head chief, or Inca, who had an advisory council elected by the various clans or gentes of the people. The office of Inca was hereditary in the female line.

The religion was based upon the worship of the sun as the supreme god, who according to the Incas had three sons: Kon or Viracocha, Pachacamac, and Manco Ccapac, the last the founder of the Incan Empire. It is, however, probable that the myths of Viracocha and Pachacamac antedate the Incas. Legend says that Viracocha (q.v.) signifies "foam of the lake or sea." One day he arose out of the waters of Lake Titicaca and created the sun, moon, and stars. He made stone statues and, putting life into them, commanded them to follow him to Cuzco. After setting Allca Vica, the ancestor of the Incas, over them he disappeared in the water.

Pachacamac signifies "He who animates the universe." He was regarded as the being who

created and ruled the world. In the valley of Rimac a vast temple was erected to this invisible god.

Next to the sun the Incas worshiped the moon, his sister and consort. Cuycha, the rainbow, was venerated as the servant of the sun and moon; Chasca, the planet Venus, as the page of the sun. The Pleiades were the next most venerated. Fire was worshiped as coming from the sun, and thunder as his servant. After these were many minor deities and canopas, which last correspond to the lares and penates of the Romans. The bloody rites so frequent in Mexico and Yucatan were unknown in Peru.

The Peruvians believed in the existence of the soul after death and also in the resurrection of the body. The good were to live a life of luxury and ease; the wicked must expiate their crimes by ages of wearisome labor.

The Empire of the Incas was a perfect theocracy. The reigning Inca was not merely the representative of divinity; he was divinity itself, the law, and the lawgiver, the violation of whose ordinance was sacrilege. The Inca appointed the chief priest, who in turn nominated all his subordinates. All the higher offices were filled by members of the Inca family. The virgins of the sun were young maidens dedicated to the service of the deity. They dwelt in convents under the charge of elderly matrons. These holy virgins were occupied in weaving the fine wool of the vicuña into garments for the Inca and hangings for the temples. In the houses of the virgins of the sun at Cuzco all the inmates, said to number 1500, were of royal blood. These virgins of the sun were brides of the Inca, and at marriageable age the most beautiful were transferred to the royal seraglio. The great nobles were also allowed a plurality of wives. At an appointed day of each year all those of marriageable age were called together in the great squares throughout the Empire. The marriage ceremony consisted in joining the hands of the couples to be united. The Inca performed this ceremony for his own kindred, pronouncing them man and wife. His curacas performed a like office for the nuptials of those of inferior rank. Land was allotted to the newly wedded pair for their maintenance, and a dwelling was built at the charge of the district.

The land was parceled out to the various clans, by whom it was owned in common, and under the wise system of administration every one not incapacitated by age or other infirmity was obliged to be a producer. Agriculture was the basis of prosperity and was carried on carefully and thoroughly, with division of labor, irrigation, manuring, and terracing of rocky slopes, to make every tillable acre yield its full return. Their chief crops were maize, potatoes, yucca, quinoa, coca, and cotton. Much attention was given to irrigation, aqueducts and canals crossing the low lands in all directions like a vast network. A good example of their irrigating works is the aqueduct at Chimbote, a barren and desolate region in northern Peru. The greater part of this fine work still exists and is computed to have a capacity of supplying 60,000,000 cubic feet of water daily. Dogs were kept as elsewhere, besides monkeys, birds, and guinea pigs, and the llama had been domesticated as a beast of burden and for its hair, from which, as well as from native cotton, were spun and woven the fabrics in common use.

Peruvian architectural structures composed of stone were characterized by simplicity, symmetry, and solidity. These stones, often huge bowlders, were put together without mortar, but so exactly cut and fitted to each other that the blade of a penknife could not be forced between them. The Peruvians excelled as road builders. Remains of many of these roads exist; the most important one is said to have extended from Quito to Cuzco.

In the manufacture of textile fabrics the Peruvians stand unrivaled among ancient peoples, being acquainted with every style of weaving known to-day. Some of their tapestry, in the excellence and finish of the weaving and beauty of the colors and designs, has probably never been excelled. They showed a degree of skill in other mechanical arts similar to that displayed in their manufacture of cloth. They have left behind them many remarkable evidences of their knowledge in working metals. They were familiar with the processes of smelting, casting in molds, hammering, and soldering. Tools and various objects of copper and bronze were in use. In the ancient tombs have been found many elegant and curious objects of gold and silver, vases, cups, bracelets, collars, and personal ornaments. Emeralds they possessed in considerable quantity, and these they cut with great skill. In the manufacture of pottery they attained a high degree of excellence. Many of these vessels are beautiful in outline. Often they represent the human form or that of some familiar object or animal, and in the firing and decoration they show an advanced stage in the potter's art.

In music they had reached considerable proficiency, judging by the number and variety of the musical instruments left behind them. Among these are Panpipes, flutes of cane and bone, clay trumpets, trumpets of shell, bells of bronze and copper, and a great variety of whistles, capable of yielding a scale of several tones. It does not appear that they ever reached the more advanced stage of stringed instruments. Of the character of their vocal music we know nothing.

They had considerable knowledge of medicine and surgery, employing bleeding and purging. They had knowledge of the healing properties of plants and successfully performed the difficult operation of trepanning. In astronomy they had made some progress, dividing the year into 12 lunar months. They also had weeks, but of how many days is uncertain. As their lunar year would necessarily fall short of the true time, they corrected their calendar by solar observations made by means of columns raised on the high lands at Cuzco. These served them for taking azimuths, and by measuring their shadows they ascertained the exact times of the solstices. The period of the equinoxes was determined by the help of a solitary pillar.

The ancient Peruvians, having no written language, made use of the quipu in keeping their accounts. It is a device consisting of a main cord with others of different colors depending from it like a fringe. Each color denoted some object. *Quipu* signifies a "knot." Knots tied in the depending cords served as ciphers, and by tying them at different distances from the main cord they could be made to represent numbers to any amount required. There was also a considerable body of legend and drama handed down by oral tradition. Among these the drama of *Ollanta*, committed to writing soon after

the Conquest, has been translated into several languages.

The burial customs varied in different parts of the country. Believing in the resurrection of the body, the Peruvians everywhere exercised care to preserve it. The mummies, or, more strictly speaking, the desiccated bodies of the dead, owe their preservation to the exceedingly dry and rarefied atmosphere of the mountains or the dry nitrous sand of the coast regions. In preparing the body for the grave it was commonly placed in a sitting posture, with the knees drawn up and the chin and hands resting upon them. In the extreme northwestern part of Peru the body was buried in an extended position. The mummies of the better class were often covered with wrappings of fine cotton cloth; over this were ponchos and blankets made of the wool of the alpaca and vicuña. With them were placed vases of elegant design and often objects of gold and silver. The ceremonies of the poor are scanty and mean and the objects buried with them of inferior quality. Food was always placed with the dead and generally the objects most prized in life. The last resting place varied with the locality. In some places vast mounds penetrated by galleries were raised over the dead. In others mummies are found in little vaults or chambers of adobe, roofed with sticks or canes, often containing four or five bodies. In Callao and parts of Bolivia the burials were in stone chulpas or burial towers.

Scattered over the country are extensive ruins of ancient temples, convents, palaces, and burial places, many of which undoubtedly long antedate the Incan Empire.

The ruins of the so-called temple, convent, and palace at Tiahuanaco, near the southern extremity of Lake Titicaca in Bolivia, are good examples of pre-Incan remains. Although but few stones of the structures are in position, enough remain to show their character and size. In these buildings copper clamps were used to hold the stones in position. The temple was rectangular in form, 445 by 388 feet. Here also is the famous monolithic doorway. The stone is 13 feet, 5 inches long, 7 feet, 2 inches high, and 18 inches thick. Through this is cut the doorway, 4 feet, 6 inches high and 2 feet, 9 inches wide. Scattered about the ruins are blocks of sandstone, trachyte, and basalt, many of them symmetrically cut and elegantly decorated. When Tiahuanaco was first visited by Europeans, these structures had been in ruins for such a length of time that even native traditions were silent as to their builders.

At Pachacamac (q.v.) the Incas erected a magnificent Temple of the Sun, a House of the Virgins of the Sun, and a temple to Pachacamac. The temple was rifled of a vast amount of gold and silver by the Spaniards.

On the islands of Titicaca and Coati, in Lake Titicaca, are a number of famous ruins. The island of Titicaca was dedicated to the sun and was the sacred island of Peru. Its most notable ruins are those of the Palace of the Incas, the Storehouse of the Sun, and the Bath or Fountain of the Incas. The Temple, a stone building 51 by 44 feet and two stories high, is in a fair state of preservation. The walls were covered inside and out with stucco and painted, as may be seen by patches still remaining on the stones. The large stone edifice called the Storehouse by the early chroniclers gained its

title from the darkness of its small rooms and connecting passages, which precluded the idea that it had been used as a habitation. The Bath or Fountain has suffered but little from time. It is a pool 40 by 100 feet and 5 feet deep, paved with worked stones and fed by four streams of water from openings cut in the stone.

On the island of Coati (dedicated to the moon) are two groups of ruins. The principal of these, the Palace of the Virgins of the Sun, is in a fair state of preservation. It is rectangular in form, 183 feet long by 80 broad. The structure, built of roughly cut stones, was two stories high. The first story is divided into 35 apartments of various sizes. The floors of the upper rooms, which were probably of wood, have disappeared. The second group consists of stone buildings with narrow passages between them. These and similar buildings on Titicaca are believed to have been used for ceremonies through which pilgrims were obliged to pass before visiting the sacred shrines.

At Cuzco the Temple of the Sun was said to have been the most imposing edifice in all Peru. Existing remains confirm the accounts of the early chroniclers. Surrounding the temple were other buildings, dedicated to the moon, Venus, the Pleiades, the thunder and lightning, and the rainbow.

Among the other notable ruins of Peru may be mentioned those of the ancient city of Chimú, consisting of a labyrinth of ruined walls, dwellings, and other structures, and gigantic huacas or burial places; Sillustani, with its chulpas or stone burial towers and sun circle; the great fortress in the valley of Cañete, near Lima, those of Hervai in the valley of Huarco (also near Lima), including a temple said to have been dedicated to the oracle deity, Rimac; the rock tombs of Ollantaytambo, these tombs being excavations, natural or artificial, in the face of a high cliff, within which the dead were placed and walled up with stones, stuccoed over and painted. Here also are the ancient porphyry quarries and the remains of numerous Inca walls and structures.

Bibliography. Rivero y Ustariz and Tschudi, *Peruvian Antiquities*, translated from the original Spanish by F. L. Hawks (New York, 1853); C. R. Markham, *Cuzco: A Journey to the Ancient Capital of Peru* (London, 1856); W. Bollaert, *Antiquarian, Ethnological, and Other Researches in New Grenada, Ecuador, Peru, etc.* (ib., 1860); C. R. Markham (trans.), *Travels of Oresca de León* (ib., 1864); E. G. Squier, *Observations on the Geography and Archaeology of Peru* (New York, 1870); Cherot, *Le Pérou* (Paris, 1876); E. G. Squier, *Travels and Exploration in the Land of the Incas* (New York, 1877); Charles Wiener, *Pérou et Bolivie* (Paris, 1880); Reiss and Stuebel, *The Necropolis of Ancon in Peru* (3 vols., Berlin, 1880-87); H. W. Bates, *Central and South America* (London, 1882); Rudolf Falb, *Das Land der Inka in seiner Bedeutung für die Urgeschichte der Sprache und Schrift* (Leipzig, 1883); Bartolomé de Las Casas, *De las antiguas gentes del Perú* (Madrid, 1892); E. W. Middendorf, *Peru: Beobachtungen und Studien, etc.* (Berlin, 1893); Haénke, *Descripción del Perú* (Lima, 1901); Arthur Baessler, *Ancient Peruvian Art* (4 vols., New York, 1902-03); T. A. Joyce, *South American Archaeology* (ib., 1912); also *Contributions from the Yale University Peruvian Expedition* (New Haven, 1912 et seq.).

PERUVIAN BARK. See CINCCHONA.

PERUZZI, pà-rùt'se, BALDASSARE (1481-1536). An Italian architect and painter, the most gifted artist of the High Renaissance. He was born at Volterra, near Siena, March 7, 1481. Little is known of his early career, but from his work it is probable that he followed Il Sodoma and Pinturicchio in painting. In 1504 he went to Rome and speedily distinguished himself in frescoes in Sant' Onofrio, in the Vatican (ceiling of the Camera del Eliodoro), and Santa Maria della Pace. Aided by Agostino Chigi, Peruzzi studied the treasures of Rome, especially its architecture, and, encouraged by Bramante, then in charge of the construction of St. Peter's, became skilled in the elements of architectural design and composition. It is notable that in his detail especially he reflects the grace and sentiment of Umbria in his choice of profiles and ornament *motifs*, exhibiting in all his work great delicacy of proportion and a pleasing individuality. In 1516 he designed for Agostino Chigi the Villa Farnesina, which was destined to become famous through the frescoes of Raphael and his school. The admirable frescoes on the ceiling of the room containing Raphael's Galatea are after his designs. Appointed architect of St. Peter's by Leo X in 1520, he made numerous studies to correct the defects of Bramante's original design, but none of these was executed. In 1525 he designed the Ossoli Palace, which shows an evident advance in the principles of planning. At the sack of Rome in 1527 Peruzzi was forced to paint a portrait of Bourbon, but upon its completion escaped to Siena, where he was made the city architect and superintended the construction of the Sienese fortifications, besides designing the Palazzo Polini and other works. At this time he executed a number of frescoes and panel paintings, among which was the well-known "Augustus and the Sibyl" in the church of Fontegiuista (Siena). His paintings are decorative in character, even to the sacrifice of truth to nature; they show the influence of Raphael and Michelangelo, and are apt to be mannered.

In 1532 he returned to Rome and commenced the building of the Massimi Palace, his architectural masterpiece, both in its general proportions and the variety of the detail and ornament. He carried on this work until his death in 1536, caused, according to tradition, by poison given by those envious of his position as architect of St. Peter's.

Consult: Letarouilly, *Edifices de Rome moderne* (6 vols., Paris, 1840-57); Donati, *Elogio di Baldassare Peruzzi* (Siena, 1879); Arthur Weese, *Baldassare Peruzzi's Anteil an dem malerischen Schmucke der Villa Farnesina* (Leipzig, 1894); W. J. Anderson, *Architecture of the Renaissance in Italy* (4th ed., New York, 1909).

PERUZZI, UBALDINO (1822-91). An Italian statesman, born in Florence. After pursuing the study of law at Siena he went to Paris and Freiberg, where he devoted himself to the study of mathematics and mining. In 1848 he was appointed gonfaloniere (chief magistrate) of Florence, but was removed in 1850 on account of his outspoken opposition to the reactionary policy of the Tuscan government. He remained a warm advocate of liberal ideas and after the revolution of April, 1859, became a member of the provisional government. After the annexation of Tuscany to the dominions of Victor Emmanuel he was elected from Florence to the

new Italian Parliament (1860). In 1861 he was Minister of Public Works under Cavour, and he continued in office under Ricasoli. Afterward he held the post of Minister of the Interior in the Farini and Minghetti cabinets. With Minghetti he went out of office in 1864, and thereafter acted as one of the Liberal leaders in Parliament.

PERVIGILIUM VENERIS (Lat., Night Watch of Venus). An anonymous poem of 93 lines, dating from the second or third century A.D., celebrating the power of Venus and referring to a nocturnal festival in her honor. It has been edited by Bücheler (Leipzig, 1859).

PESADO, pè-sà-dò, JOSÉ JOAQUÍN (1801-61). A Mexican poet and politician, born at San Agustín del Palmar. He was chiefly self-educated while living in Orizaba as a young man, became proficient in languages, science, and philosophy, entered politics in 1833 as member of the Vera Cruz Legislature, and five years afterward was made Minister of the Interior. In 1854 he gave up his post as Foreign Minister, which he had held for eight years, to become professor of belles-lettres in the University of Mexico. He became joint editor of the paper *La Oposición* in 1834, and wrote a novelette directed against the Inquisition, though religious subjects and Catholic sentiment prevail in his poems. Besides a collection of them, *Poesías originales y traducidas* (1839; 3d ed., 1886), he published a fragment, *La revelación* (1856), and a Spanish version of part of Tasso's *Gerusalemme liberata* (1860). Consult: José M. Roa Bárcena, *Biografía, etc.* (Madrid, 1878); Francisco Pimentel, *Historia crítica de la literatura y de las ciencias en México: Poetas* (Mexico, 1885); *Antología de poetas hispano-americanos*, vol. i, edited by Marcelino Menéndez y Pelayo (Madrid, 1893).

PESARO, pà-zà-rò. The capital of the Province of Pesaro e Urbino, Italy, situated at the mouth of the Foglia, on the Adriatic and on the Bologna-Ancona Railroad, 20 miles northeast of Urbino (Map: Italy, D 3). It has broad streets and is partly surrounded by walls, with five ancient gates extant. Its fifteenth-century castle is now used as a powder magazine. There are the old cathedral of San Francesco and the new cathedral of Santa Maria Assunta, several palaces, including that of the dukes of Urbino, a public library of 50,000 volumes, a museum with collections of paintings and antiquities, a technical institute, an episcopal seminary, an agricultural school, a collection of majolica ware, a musical lyceum, founded by Rossini, who was born here. A bridge over the Foglia dates from the time of Trajan. The industries are silk spinning, shipbuilding, and manufactures of ironware, earthenware, machinery, and oil. There is a brisk shipping trade in figs, wine, oil, hides, silk, iron, lead, grain, and cheese. Pop. (commune), 1901, 25,103; 1911, 27,348. Pesaro, the Pisaurum of the Romans, was founded 184 B.C. It was destroyed by the Goths and restored by Belisarius and later formed a part of the Pentapolis. Pepin presented it to the papacy. At the end of the thirteenth century it came under the rule of the Malatesta family, who sold it to the Sforza family in 1445. It was subsequently ruled by the Rovere dynasty of Urbino. In 1631 it reverted to the states of the Church, and since 1860 has formed a part of united Italy.

PESCADORES, pès-kà-dò-ràs. A group of small basaltic islands (called by the Japanese

Hōko-tō or **Hōko-guntō**) situated off the west coast of the Japanese island of Formosa and on the tropic of Cancer (Map: Japan, C 8). They cover an area of about 85 square miles and are mostly flat and barren. The largest of the group, Hokoto, has a good harbor. The inhabitants are engaged principally in fishing, and dried fish is the only export. Pop., 1898, 49,288, chiefly Chinese; 1908, 57,809. The group was ceded to Japan, together with Formosa, in 1895, and is now an administrative dependency of Formosa.

PESCARA, pēs-kā'ra, FERNANDO FRANCESCO D' AVALOS, MARQUIS OF (c.1489-1525). A Neapolitan general in the Spanish service. He was taken prisoner by the French at the battle of Ravenna in 1512. During his captivity he composed poems addressed to his wife, Vittoria Colonna. Being soon after ransomed, he took part in several minor battles and contributed greatly to the victory over the French at Pavia in 1525, but was severely wounded. He commanded the army in Italy after the battle and was approached by Morone, the counselor of Francesco Sforza, Duke of Milan, in the interest of an Italian national party, since it was believed that Pescara was dissatisfied with Charles V for not rewarding his services sufficiently. Pescara, however, betrayed the plot. He died soon after, Nov. 30, 1525.

PESCHIERA, pēs-kyā'ra. A fortified town in the Province of Verona, Italy, at the mouth of the Mincio River on the south shore of Lake Garda, 15 miles west of Verona (Map: Italy, C 2). It was a member of the famous Quadrilateral (q.v.) until 1860. In the Middle Ages it was known as Piscaria, and belonged first to Verona and later to the Venetians, who strengthened its fortifications. It became part of Italy in 1866. Pop. (commune), 1901, 2351; 1911, 2801.

PESCIA, pēsh'ā. A town in the Province of Lucca, Italy, 29 miles west by north of Florence, on the Pistoia-Pisa Railroad. It has a fourteenth-century cathedral, the church of San Francesco and an old castle. There are manufactures of silk, leather, paper, and hats, and a trade in wine, olives, and fruit. Pop. (commune), 1901, 17,517; 1911, 17,882.

PESELLINO, pāzēl'ē'nō, FRANCESCO DI STEFANO (c.1422-57). A Florentine painter of the Renaissance, born in Florence. He was the grandson, and perhaps the pupil, of Giuliano Pesello, and was influenced by Filippo Lippi and Masaccio. His work is broad, quiet in tone, and shows great personal feeling and a sense for style. His remaining paintings are chiefly decorative panels—often part of a chest—such as "Scenes from the Argonauts," in the Metropolitan Museum, New York, and the "Triumphs of Petrarch," in the Gardner collection, Boston; or small madonna pictures, good examples of which are in the Metropolitan Museum, the Musée Condé, Chantilly, and Dorchester House, London. There also survive fragments of altarpieces, including the fine predella in the Louvre and the Accademia, Florence, and a "Trinity" in the National Gallery, London, thought to have been completed by Lippi. Consult Werner Weisbach, *Francesco Pesellino und die Romantik der Renaissance* (Berlin, 1901).

PESHAWAR, or **PESHAWUR**, peshā'wēr. The capital of the Northwest Frontier Province, British India, on the river Bara, a tributary of the Indus, 20 miles from the Afghan frontier

and 10½ miles east of the entrance to the Khyber Pass (q.v.) (Map: India, B 2). It is irregularly built, with narrow winding streets, and is surrounded by a mud wall with watch towers. Although it dates from the fifth century, the city has few ancient monuments, and consists chiefly of mud houses. The cantonments contain a public garden, Christian churches, and a mission school. Being on a natural trade route from Central Asia, Peshawar is an important market; its bazars are frequented by numerous Afghan and other trans-Himalayan merchants who deal in horses, woolen goods, silks, dyestuffs, gems, and carpets. Local manufactures consist of scarfs, cloth, and arms. Peshawar is the terminus of a railroad connecting it with the main railroad system of India. Two miles from the city is an important British military station. Pop., 1901, 95,147; 1911, 97,935, of whom three-fourths are Mohammedans and 4000 Christians.

PESHITO, pē-shē'tō, or **PESHITTO**. See BIBLE, IV. *The Versions of the Bible*; III. *Aramaic*.

PESHWA, pēsh'wā (Pers., leader). The Brahman ministers of the Mahratta, or Marāthā, dynasty of India. On the decline of the Mahratta rulers the power of their ministers increased until in 1718 the first Peshwa, Balaji Vishvanāth, acting in the name of Maharajah Sahu, marched against Delhi to assist Farrukh Shah against the Mogul Emperor, Jehandar Shah. The Peshwa rule lasted for exactly a century. Balaji was succeeded in 1720 by his son, Baji Rao, who for 20 years was active in expeditions of conquest, even wresting Bassem from the Portuguese in 1739. He was followed in 1740 by his son Balaji Baji Rao, under whose administration the Mahrattas reached the acme of their greatness. They ravaged northern India far and wide, levied *chauth*, or a quarter tax, on Bengal, and were in formal possession of Orissa. In 1761, however, the last year of Balaji's life, the power of the Peshwas in northern India was ended by their rout at Panipat by Ahmed Shah of Kabul, conqueror of the Punjab. Balaji was succeeded, in 1761, by his son, Madhu Rao, who proved more than a match for Hyder Ali, and at the same time governed with remarkable order the Mahrattas themselves. In 1773, after the assassination of Narayan Rao, who ruled for a short time after Madhu's death in 1772, Raghunath Rao, a brother of Balaji Rao, became Peshwa. To defend himself against Narayan's posthumous son, Madhu Rao II, he was forced to call upon the English for aid. The First Mahratta War (1779-82) then broke out, in which Raghunath failed in his object, despite the aid of the English, and in 1782 he became a prisoner, while Madhu Rao succeeded him as Peshwa. Madhu committed suicide in 1795, after a puppet reign, and was followed in 1796 by Raghunath's son, Baji Rao II, the last of the Peshwas. To secure himself, Baji invoked English assistance, and by the Treaty of Bassem in 1802 ceded territory for the maintenance of the force given him. The result was an attack by the other Mahratta rulers and the Second Mahratta War (1803). This gave the Peshwa a prolongation of his rule, but he revolted in 1817. The Third Mahratta War, which followed, ended in utter defeat for Baji and the extinction of the Peshwa power. His territory, which now forms the Bombay Presidency, was annexed by the English, and Baji Rao was a British pensioner until his

death in 1852. His adopted son was the notorious Nana Sahib (q.v.). Consult Stanley Lane-Poole, *Medieval India under Mohammedan Rule 712-1764* (New York, 1903), and James Burgess, *The Chronology of Modern India, 1494-1894* (Edinburgh, 1913). See SINDIA.

PESNÉ, pán, ANTOINE (1683-1757). A French portrait painter, born in Paris. He studied under his father, Thomas, and his uncle, Charles de la Fosse, and afterward traveled in Italy. In 1710 he was summoned to Berlin by Frederick William I, and passed most of his life there, becoming court painter to Frederick the Great and director of the Academy. His portraits of Frederick the Great and of the engraver Schmidt, in the Berlin Museum, and that of Vleughels, in the Louvre, are vigorously and solidly painted, and many other excellent portraits, including those of all the Prussian royal family, are in the galleries of Dresden, Munich, and Brunswick, and in the royal palaces of Berlin and Potsdam.

PES PLANUS. See FLATFOOT.

PESSIMISM (from Lat. *pessimus*, worst). The doctrine that life is, or tends to become, wholly undesirable, or that the world is essentially evil. It is thus contrasted with optimism (q.v.), which teaches that the world is essentially good, and with meliorism, which maintains that the world is constantly becoming better and life more endurable.

Pessimism is characteristically a mental attitude towards life rather than a philosophical doctrine, and its significance is ethical rather than metaphysical. It usually appears, however, as a consequence of reflection and so of a certain amount of intellectual enlightenment. Most commonly it is the outgrowth of a consciousness of human impotence, and especially of the inadequacy of human effort in the struggle for ideal attainment. Where pessimism is based upon metaphysics the world is usually conceived to be governed by blind necessity and human life to be a toy of fate. Accordingly the doctrine is most commonly maintained by those who hold a pantheistic conception of the universe, as the Orientals, or by those who conceive it as wholly determined by mechanical laws or as wholly materialistic. Optimism, on the other hand, is almost an inseparable corollary of belief in an omnipotent and beneficent God, and so is characteristic of theistic religions. (See LEIBNITZ for the argument.) At the same time there is a purely empirical pessimism—the denial that human life per se is worth while—which is compatible with any cosmological conception, whether theistic or not. Such a pessimism is that of the author of Ecclesiastes, and such a pessimism is the implied basis of Christian asceticism, by which physical life is valued only as a discipline for a more worthy existence.

Historically, philosophical pessimism has been of two leading types. Perhaps the most ancient is the pessimism of India, the essential character of which is the denial of the value of life on the ground that its pains overbalance its pleasures and progressively tend to do so with the growth of desire. This doctrine does not appear in the Vedic hymns; for these belonged to the restless, active period of the history of the Aryans in India, and activity is little compatible with pessimistic theory; but it early developed with Brahmanistic pantheism and attained its full growth in Buddhism (q.v.). The salient features of Indian pessimism are: first, the asser-

tion that life is predominantly painful; second, the notion that conscious evolution is dominated by growing desire and growing failure to attain satisfaction; and, third, the conception of Nirvana, or annihilation of individual consciousness, as an ultimate relief from the fever of living.

In contrast to this Oriental pessimism stands the Greek type. This was faintly foreshadowed by the Platonic doctrine of the impotence of the material world in its efforts to attain the perfect good embodied in the divine ideas. Plato himself was saved from pessimism by the very vividness of his idealism; but with the philosophers who followed him the ethical problem became paramount and the problem of the existence of evil and the fact of human insufficiency were poignantly recognized. The most metaphysical and thoroughgoing of Greek pessimists was Proclus (q.v.), who taught that the whole evolution of the world is away from the divine or good.

But there was little congenial to pessimism in the exuberant paganism about the ancient Mediterranean; the classic peoples were too heartily in love with life. With the Teutonic Aryans the case was different. A gloomy fatalism was early characteristic of their myth and mood, and though the Northman looked forward to eventual annihilation in the cataclysm of Ragnarok (q.v.), the twilight of the gods, rather than through passive absorption, his ultimate conception varied little from that of the Brahman. And the Teutonic point of view seems to have dominated medieval Europe, giving it that ascetic pessimism which Christianity made empirical rather than ultimate. In modern times, however, pessimism has reasserted itself, largely under the influence of scientific determinism. The notion that the world is governed by invariable laws and conserves none but material elements has seemed to argue the defeat of the commonest human expectations. The pessimistic reaction has appeared most strongly in poets, notably in the Italian Leopardi (q.v.) and in James Thomson, the author of *The City of Dreadful Night*. In philosophy Schopenhauer and Hartmann (qq.v.) are the chief exponents of modern pessimism. Schopenhauer as a follower of Kant believed that the world of phenomena is a system of ideas, but that each person experiences directly in himself his own will as being the inner reality of that which presents itself to him in the world of phenomena as his body. Hence Schopenhauer reasons that will is the ultimate nature of all reality. But he regarded this fundamental will as blind, uneasy, hapless tending, while intelligence is a suffering consequence of the will's activity. The painfulness of conscious life he endeavored to establish upon empirical, psychological grounds, and this feature of his pessimism is plainly Oriental in source. His further doctrine, however—that final escape from the misery of existence is to be attained through pure intelligence defeating the blind energy of the will by overcoming desire—seems to be allied not only to Brahmanism, but also to the Platonic doctrine of escape to the world of divine ideas and the Spinozistic theory of immortality through the soul's identification with eternal verities. (See PLATO; SPINOZA.) Schopenhauer's disciple, Hartmann, carried the doctrine further by arguing that the evolution of consciousness from an unconscious universe must ultimately result in an intelli-

gence so acutely powerful that it should not only put an end to individual consciousness and desire, but compel the whole world's suicide.

It is but fair to state that pessimism is not necessarily a result of deterministic metaphysics nor yet of pantheism. Herbert Spencer's meliorism teaches that the world is compelled to evolve desirable existence, and, indeed, that its essential activity is one of betterment; while Nietzsche, originally a disciple of Schopenhauer, finds optimistic inspiration in the thought that all reality is a will to power, whose highest expression in the superman is its fullest justification; the necessity for pain he recognizes, but counts it of small import in comparison.

Bibliography. Arthur Schopenhauer, *The World as Will and Idea* (Eng. trans., London, 1883-86); K. R. E. von Hartmann, *The Philosophy of the Unconscious* (Eng. trans., ib., 1884); E. E. Saltus, *The Anatomy of Negation* (ib., 1886); A. M. Cao, *Le pessimisme au 19e siècle: Leopardi, Schopenhauer, Hartmann* (4th ed., Paris, 1889); James Sully, *Pessimism: A History and Criticism* (2d ed., London, 1891); Arthur Schopenhauer, *Studies in Pessimism*, translated by T. B. Saunders (3d ed., ib., 1892); A. J. Dörner, *Pessimismus, Nietzsche und Naturalismus* (Leipzig, 1911).

PES/SINUS (Lat., from Gk. Πέσσινοῦς, *Pessinonous*). An important Phrygian city of Galatia (q.v.), on the river Sangarius, and on the southern slopes of Mount Dindymus. It passed under the control of the Gauls, about 164 B.C., and became an important commercial centre. The city was best known, however, both before and after that event, as the chief centre of the worship of Cybele (q.v.). The city passed from Gallic to Roman control. In the fourth Christian century Pessinus was the capital of Galatia Secunda or Galatia Salutaris and seat of a bishopric. From the sixteenth century onward the city was dismantled to build the fortress of Justinianopolis, 8 or 9 miles northwest, known now as Sivri-Hissar.

PEST, *pěst* A city of Hungary, now united with Buda to form Budapest (q.v.).

PESTALOZZI, *pës'tà-lòt'sè*, JOHANN HEINRICH (1746-1827). A Swiss educational reformer and the chief founder of modern pedagogy, born at Zurich, Jan. 12, 1746. As a student in the University of Zurich he allied himself with the young reformers of whom Lavater was the leader, and in a contribution to the *Memorial*, the organ of that faction, he expressed a wish that intelligible principles of education might be disseminated among his countrymen. He studied theology, then law, then, under the influence of the current naturalistic philosophy, and particularly Rousseau, turned to agriculture, with the avowed purpose of improving the condition of his countrymen by setting for them a good example in scientific agriculture, and, finally, when past middle life, began work as a teacher. He undertook to put in constructive form the ideas cast by Rousseau in a destructive and critical form. He it was who tested the value of education according to nature. Pestalozzi himself was unpractical and a bad organizer and manager, yet through his writings he aroused the Germanic peoples to the importance of social reform through education, and through his personal efforts he inspired a number of disciples who developed and carried out the principles of his practice until they became the basis of the educational movement

of the nineteenth century. In 1767 he bought 100 acres of poor land and erected a house thereon, naming the place Neuhof. Here he brought, two years later, his bride, and here for seven years he sought to demonstrate Rousseau's ideal life in a return to nature. Though the experiment was a failure, yet in his attempt to educate his one child after the manner of the *Emile* he discovered the deficiencies of Rousseau's teachings, and later rejected the extravagances and accepted the essential truths of the teachings of his master. Here also he wrote a *Father's Journal*, which laid the basis of modern child study as an approach to the solution of educational problems. Undaunted by poverty and failure and moved by the wretched state of the children of the poor, in 1775 he turned the farm into an asylum, where he housed, boarded, and clothed the children, in return for such work as they could give, thus hoping to regenerate his people by striking at the root of the evil through the industrial education of the young. The failure of this enterprise in 1780, due in a measure to the unsympathetic attitude of the parents of his wards, revealed to him the doubtful nature of the principle upon which it had been based, viz., that the reform of the individual and of the race could come through an improvement of the environment. Then followed a period of 18 years of financial distress and a corresponding period of great literary activity. During this time he gave up all practical efforts and devoted his energies to thinking out social and educational problems. The solution reached was that individual and social reform can come only through the moral and intellectual improvement of the individual by means of educational effort. In his *Abendstunde eines Einsiedlers* (published 1780) and his *Lienhardt und Gertrud*, the first volume of which was issued in 1781, he first presented this doctrine. The latter work, soon expanded into several volumes, was a novel descriptive of peasant life, which had an enormous popularity, since it fell in with the idealistic and revolutionary tendencies of the times.

The fundamental ideas of *Lienhardt und Gertrud* were that the condition of the people was to be bettered by education, not by revolution; that education was to centre in the home and not in a separate institution; that this education was to begin at the cradle and that the first few years were of the greatest importance; that an ignorant mother, by following the method given in his book, could educate her children as well as a teacher in possession of all science; that if homes were thus reformed misery would disappear and society would be revolutionized. From 1787 to 1797 Pestalozzi was again engaged in agricultural experiments. During this period he formed the acquaintance of Fellenberg and Fichte, and in 1792 was proclaimed French citizen with Klopstock and Washington. After the long period of literary work, during which Pestalozzi wrote 20 volumes, the exigencies of war forced him again into active life, and in 1798 he became director of an orphan asylum at Stanz, where he attempted to work out the ideas of *Leonard and Gertrude* (as the work is known in English), of combining learning with handwork and centering it upon the objects of the child's immediate environment. It was along this line that Pestalozzi thereafter worked and had his permanent influence. In 1799 he entered upon active schoolroom work at Burgdorf, and later at several other places.

In 1802 Pestalozzi went to Paris as a member of the consulta summoned by Bonaparte to settle the fate of Switzerland, and while there memorialized the First Consul upon the educational needs of his country, but received the curt reply that there was no time to bother about A B C matters. He established the Institute at Yverdon in 1805, from which emanated the influence that was to give inspiration to all modern education. Here gathered not only the children of the schools, but great numbers of teachers from most of the leading states in Europe in a sort of normal school; here were sent by the Prussian government the teachers that were to assist in introducing his ideas into the German Volksschulen; and here he was visited by several Americans, whose reports on their return exercised a profound influence on the United States. Even here his work as a practical teacher was unsuccessful, largely through his inability to deal with a few of his assistants, and in 1825 he was forced to withdraw as a broken-down and disappointed old man. He died at Brugg, Feb. 17, 1827.

Pestalozzi never systematized his ideas or his method. In 1801 he published *Wie Gertrud ihre Kinder lehrt*, which purports to give a summary of his work, but it contains no definite formulation of either principle or method. His great effort, on the purely educational side, was, to use his own expression, to "psychologize education." To this effort is due the great attention that has been given to the study of method, both practical and theoretical, from that day to this.

Bibliography. In addition to many editions of single works, there is a complete edition in 18 volumes by Seyffarth (Berlin, 1881); *Lienhardt und Gertrud* has numerous translations or abridgments, as also *Wie Gertrud ihre Kinder lehrt*. Consult also: Roger de Guimps, *Pestalozzi: Life and Work*, translated from the second French edition by J. Russell (New York, 1890); J. A. Pinloche, *Pestalozzi and the Foundation of the Modern Elementary School* (ib., 1901); Hermann Krüsi, *Pestalozzi: His Life, Work, and Influence* (ib., 1903); Henry Barnard, *Pestalozzi and his Educational System* (Syracuse, 1906); Gabriel Compayré, *Pestalozzi and Elementary Education* (New York, 1907); Henry Holman, *Pestalozzi: An Account of his Life and Works* (ib., 1908); J. A. Green, *Life and Work of Pestalozzi* (Baltimore, 1914); id., *Educational Ideas of Pestalozzi* (ib., 1914).

PESTALOZZIAN (pēs'tā-lōt'si-ān) **MOVEMENT.** A term sometimes applied to the modern tendency to base schoolroom instruction on psychologic principles. It dates from the days of Pestalozzi (q.v.). This movement began in Germany in the early part of the nineteenth century and was initiated in the United States by Horace Mann (q.v.). Consult W. S. Monroe, *History of the Pestalozzian Movement in the United States* (Syracuse, 1907). See **EDUCATION**; **OBJECT TEACHING**; **PEDAGOGY**.

PES'TILENCE (OF., Fr. *pestilence*, from Lat. *pestilentia*, plague, from *pestilens*, infected, from *pestis*, pest). The terms "plague" and "pestilence" have until recent times been used indiscriminately to denote any diseases of an epidemic character which affected large masses of the community and were remarkable for their fatality, such as the Oriental plague, the sweating sickness, cholera, certain virulent forms of fever, etc. The term "loimos" was applied by the Greeks

to a species of epidemic remittent fever; and the plague of Athens described by Thucydides is manifestly an epidemic form of the same disease, which is endemic in the summer season on the coasts and islands of the Mediterranean and particularly the Archipelago. We find in the early history of the colonization of the West Indian islands and the United States frequent examples of the term "plague" being applied to the remittent fever of these regions, and especially to epidemic attacks of yellow fever. During the Middle Ages the term "pestis" was applied to numerous disorders, such as syphilis, smallpox, erysipelas, epidemic sore throat, petechial fever, the sweating sickness, gangrenous pneumonia, ergotism, etc. The Black Death of the fourteenth, fifteenth, and sixteenth centuries was the bubonic plague; and the Great Plagues in China in the fourteenth century were probably also bubonic.

Several Hebrew words are translated "pestilence" or "plague" in the Old Testament. Some of these pestilences are beyond the reach of inquiry; others have the characteristics of modern epidemics. See **BLACK DEATH**; **PLAGUE**.

PESTO. See **PÆSTUM**.

PET'AL (from Gk. *πέταλον*, *petalon*, leaf, neut. sing. of *πέταλος*, *petalos*, outspread). One of the individual parts of the corolla (q.v.), the inner set of floral leaves, which is usually the showy set. See **FLOWER**.

PET'ALESHA'RO. A Pawnee chief of the Skidi band who distinguished himself by an act of humane bravery in rescuing a captive girl who was about to be sacrificed by his tribe. The captive, a girl taken from the Sioux tribe, was being led to the scaffold when Petaleshoro, who as yet was only a young warrior, broke through the circle, seized the girl, and, throwing her upon one of two horses which he had in waiting, was off with her before the people could recover from their surprise. Distancing pursuers, he escorted her to a place of safety near her own country, and then left her to find her way home on the horse which he gave her. On returning to his village he faced the anger of the tribe with such boldness that he was allowed to go unharmed, and was ultimately able to break up the practice of human sacrifice by procuring the substitution of a vicarious ceremony. On subsequently visiting Washington as a delegate from the Pawnee in 1821 he was presented with a medal by the ladies of the city in recognition of his services to humanity. See **PAWNEE**.

PET'ALODY (from Gk. *πεταλῶδης*, *petalōdēs*, leaflike, from *πέταλον*, *petalon*, petal + *εἶδος*, *eidos*, form), or **PET'ALIZA'TION**. The replacement of other organs of the flower, especially the stamens and pistils, by petals. It results in what is known as double flowers. All stages in the transition to petals are seen in the stamens of the white water lily. The exact cause of petalody is not known, and double flowers so frequently seen in cultivation are regarded as sports, but are often associated with conditions of high nutrition.

PETALUMA, pet'ā-lōō'mā. A city in Sonoma Co., Cal., 36 miles by rail north of San Francisco, at the head of navigation on Petaluma River, an arm of San Francisco Bay, and on the Northwestern Pacific and the Petaluma and Santa Rosa railroads (Map: California, C 4). Noteworthy features are the Carnegie library, Hill Plaza and Walnut parks, and Pepper Kin-

dergarten. Petaluma is situated in one of the most productive poultry regions in the country, the marketing of eggs and fowl being the most important industry of the city. Others include silk and flour mills, machine shops and foundries, incubator plants, shoe, saddletree, gas-engine, box, cheese, and vinegar factories, feed, grist and planing mills, tanneries, etc. Pop., 1900, 3871; 1910, 5880.

PETARD, pé-târd' (OF. *petard*, *petart*, Fr. *pétard*). A device for demolishing the defenses of an enemy, creating a breach through which the besiegers may force an entry. Under modern conditions it has become obsolete. It consisted of a half cone of thick iron filled with powder and ball and fastened to a plank which was provided with hooks, by which it could be attached to a gate or wall. The engineers attached the petard, lighted the slow-burning match by which it was to be fired, and retired. When the explosion took effect a supporting column charged through the breach and took advantage of the confusion within. A petard would sometimes contain 15 pounds of powder.

PETAIVIUS, DIONYSIUS, or DENIS PÉTAU (1583-1652). A French theologian and philologist, born at Orléans. His father, a man of learning, encouraged his studies, and he took up mathematics and belles-lettres, also philosophy, which he pursued both at Orléans and Paris. During his student years at Paris he formed a warm friendship with Isaac Casaubon (q.v.), whom King Henry IV had invited to Paris in 1600. In 1602 he accepted the chair of philosophy in the University of Bourges, but resigned in 1605 and entered the Jesuit Order at Nancy. He studied theology for two years at the College of Pont-à-Mousson, and in 1621 became professor of *theologia positiva* at the University of Paris and held the post till 1643, when he retired and devoted the rest of his life to his work on theology. He is regarded as one of the greatest scholars the Jesuit Order has possessed. In philology his works include annotated editions of Synesius (1611), Themistius (1613), Julian (1614), Nicéphorus (*Breviarum Historicum*, 1616), and Epiphanius (*Opera Omnia*, 1622). In his *Opus de Doctrina Temporum* (Paris, 1627) he presented a new system of chronology, further developed in *Urano-logion* (1630). A history of the world, *Rationarium Temporum* (1633), from the earliest times down to 1632, has been reprinted as late as 1849. His great work, a history of doctrines, *Opus de Theologicis Dogmatibus* (5 vols., 1644-50), was left unfinished. Consult Franz Stanonik, *Dionysius Petavius: ein Beitrag zur gelehrten Geschichte des 17. Jahrhunderts* (Graz, 1876), and J. C. V. Chatellain, *Le Père Denis Pétau* (Paris, 1884).

PETCHARY, péch'â-ri (West Indian name, onomatopoeitic in origin). An old book name for the large tyrant flycatchers of the West Indies, known elsewhere as kingbirds. The term has survived, however, in Jamaica for the gray kingbird (*Tyrannus dominicensis*), and especially for *Tyrannus caudifasciatus*, one of the most common birds of the West Indies, often shot in the fall as a table delicacy. See KINGBIRD.

PETCHNIKOV, péch'ni-kóf, ALEXANDER (1873-). A Russian violinist. He was born at Yeletz in the Province of Orël and at the age of 10 entered the Moscow Conservatory, where he studied under Johann Hrimaly, winning the first prize and a gold medal. After

his début as a violin virtuoso in Berlin (1895) he made several successful tours in Europe and in America, playing in recital and with the best orchestras. He made Berlin his residence.

PETCHORA, pâ-chô'ra, or **PECHORA**. A river of north Russia. It rises on the west slopes of the Ural Mountains, in the Government of Perm, and flows northward through the Government of Vologda and a part of Archangel; then it turns to the southwest and finally resumes its original course at the mouth of its tributary the Tsylma, and enters the Arctic Ocean through an extensive delta, 125 miles long, containing numerous islets (Map: Russia, H 1). Its entire length is estimated at nearly 1000 miles, of which most is navigable except during the winter, when the upper reaches are frozen for 190 days and the lower reaches for 138 days. The chief tributaries are the Koshva, Ishma, Ussa, and Tsylma. The region through which the river flows is known as the Petchora, or Arctic steppes. The Petchora is of considerable importance as a navigable waterway, being used for the transportation of fur, fish, etc., into the interior, from which grain and other necessities of life are sent in return into the northern districts. Consult J. A. Harvie-Brown, *Travels of a Naturalist in Northern Europe* (2 vols, London, 1905).

PETECHIA, pé-ték'â (Neo-Lat., from It. *petecchia*, spot, scab, from Lat. *petigo*, scab, or from Lat. *pittacium*, from Gk. *πῖττακιον*, *pittakion*, label, plaster). A name given to a minute hemorrhagic spot of a dusky crimson or purple color, quite flat, with a well-defined margin and unaffected by pressure, which closely resembles fleabites. Petechiæ result from a minute extravasation of blood beneath the cuticle. They may occur on any part of the skin or mucous membranes, and when large are called ecchymoses. They indicate an altered state of the blood and are often symptoms of very serious diseases, as typhus fever, plague, and scurvy. They likewise occur in very severe cases of smallpox, measles, and scarlet fever, when their presence must be regarded as indicative of extreme danger. Cerebrospinal fever is sometimes called petechial fever, from the small hemorrhagic spots which cover the body in certain cases.

PETER (Lat. *Petrus*, from Gk. *πέτρος*, *petros*, rock), or **SIMON PETER**. One of the Twelve Apostles of Jesus Christ. His original name was the Hebrew *Shim'ôn*, or *Simeon*, which was easily shortened to conform to the Greek Simon. He was the son of a certain Jona and (cf. John i. 44) was a native of Bethsaida. In his early manhood he was a citizen of Capernaum. Here he had a house, and with his brother Andrew was engaged in the fishing business in partnership with Zebedee and his sons (Mark i. 16-31 and parallels). He was married, but whether he had any children is not known. It is likely that he was a man of some property, not a poor, grossly ignorant laborer, though he was not rich. Of his early education and attainments we know nothing. Galilee, his home, was practically a bilingual country, with a fair degree of Greek culture possessed by the Gentile elements of the population. Hence Simon had opportunity for becoming acquainted with colloquial Greek, and there is no good reason for supposing that he was unable to use his Greek Old Testament intelligently.

When the news of the preaching of John the Baptist reached Galilee Simon and Andrew went

to hear him. They were impressed and attached themselves to him as at least temporary disciples. Here they became acquainted with Jesus, who gave to Simon the Aramaic surname Cephas, rock, whence his Greek name Peter (John i. 35-42). After continuing with Jesus a while the brothers returned to their accustomed occupation. Soon after he opened his public ministry in Galilee Jesus summoned them from their nets to a permanent discipleship (Mark i. 16 and parallels). They at once left all and followed him. Into the details of Peter's experiences during his two years' intimate association with Jesus we cannot enter. The many incidents recorded in the Gospels give a fairly adequate idea of his general character and disposition. He was a whole-hearted though often blundering disciple. His willingness to be taught enabled him finally to grasp certain great essentials of Jesus' character and mission, so that Jesus could say that he was the rock on which he would build his Church (Matt. xvi. 18). He was one of the three disciples with whom Jesus was most intimate, who alone witnessed his transfiguration (Mark ix. 2-10) and the agony in Gethsemane (Mark xiv. 33). Thoroughly convinced of Jesus' Messiahship, even when the tide of popular favor had begun to ebb, he was yet in great need of enlightenment as to what it really signified (Mark viii. 29-33). His impulsive nature led him to deny his discipleship when Jesus was on trial, but his deeper and more permanent love for his Master soon reasserted itself, and he returned to the scene and was an eyewitness of the Passion. (Cf. 1 Peter v. 1, and the article PETER, EPISTLES OF.) He was the first of the Apostles to whom Jesus revealed himself after his resurrection (1 Cor. xv. 5; cf. Luke xxiv. 34), was present at most of the post-resurrection interviews between Jesus and the disciples, and to him in particular Jesus tenderly and suggestively reentrusted his apostolic commission, at the same time intimating the self-denial and suffering that awaited him in his future career (John xxi. 15 et seq.).

After the departure of Jesus Peter was easily recognized as one of the leading spirits of the little company of believers who were hoping for something, just what they did not know, and who formed the nucleus of the Church. It was he who suggested the appointment of Matthias to take the place of Judas Iscariot, and a few days later, on the day of Pentecost, made the first public attempt to explain and set forth the claims of Christianity and urge its acceptance upon his fellow Jews. (Acts i and ii.) It is interesting to note how rudimentary and undeveloped are the definitions of the chief points of the Christian faith as stated by Peter in the Pentecost sermon. The main problem was how to prove to the Jews that the Jesus they had crucified was really the Messiah, and the chief dependence was naturally upon such Old Testament passages as seemed to support this position. During the next few years, when the first converts were being secured and the first steps in organization planned, Peter seems to have been the most influential man in the Church. His fellow worker and most intimate friend was John. When Christianity spread beyond the bounds of Jerusalem into the various districts of Palestine, Peter and John, and afterward Peter alone, rendered efficient aid by visiting and further instructing the new con-

verts. In Samaria, on such a visit, he came in contact with the local magician Simon Magus (q.v.), a professed convert, whose ignorant cupidity he sternly rebuked. (Acts viii. 20.) Another such tour led him as far as Joppa, on the coast, whence, by divine guidance, but against his prejudices, he went to Caesarea to proclaim Christianity to Cornelius, the Gentile centurion. He received him and his house into Christian fellowship, and set aside his prejudices so far as to sit at table with them, something he had never before done. (Acts x.) For such conduct an explanation was demanded by some in the mother Church. Though it was pronounced satisfactory, it is probable that certain ultra-conservatives did not approve of what had been done. (Acts xi.)

Up to the attempt of Herod Agrippa I to put him out of the way, i.e., near A.D. 44, or for about 15 years (cf. Acts xii. 3 et seq.), it is probable that Peter made his headquarters in Jerusalem. He was the one member of the apostolic band whom Paul, three years after his conversion, went to Jerusalem to consult. (Cf. Gal. i. 18.) Paul was with Peter 15 days, and in that time was doubtless given a full account of the earthly career of Jesus as complete as Peter's memory allowed. This notice from Paul's own letter is weighty evidence as to Peter's influential position in primitive Christian circles.

After his escape from Herod he left Jerusalem. We know nothing more of him until the time of the Council of Jerusalem (49 A.D.). Here, with characteristic loyalty to the witness of the Holy Spirit, he urged a liberal attitude towards Gentile Christians. With James and John he gave Paul and Barnabas the right hand of fellowship. Soon after this he seems to have visited Antioch (Gal. ii. 11 et seq.), and, true to his principles, fellowshipped heartily with the Gentile members of the Church there, making no distinction between them and himself. But when overzealous emissaries from James of Jerusalem came to Antioch and insisted that the two classes should not eat together, Peter vacillated and weakly submitted to their dictation. This brought forth a sharp and well-deserved public rebuke from Paul. (Gal. ii. 14 et seq.) There is no reason to suppose that this resulted in any lasting personal animosity between the two. As the years passed Peter's views of Christian truth broadened and deepened, partly through the influence of Paul's doctrines, but also because of his own honest and earnest spirit. Of Peter's further career we possess almost no information. It is probable that he continued to be occupied in missionary labors, mainly among Jewish communities, in accordance with the agreement noted in Gal. ii. 9. On his journeys he was accompanied by his wife. (1 Cor. ix. 5.) In 1 Cor. i. 12 (written about 53 or 54 A.D.) reference is made to a Cephas party in the Corinthian church, but this does not imply necessarily that Peter had personally visited Corinth. If the word Babylon (1 Peter v. 13) is to be taken literally, he must have labored mainly in eastern Syria and the Tigris-Euphrates valley. But Babylon may be only another name for Rome and is usually so interpreted. The view that Peter wrote 1 Peter at Rome between 56 and 59 A.D. to Jewish and other Christian communities of Asia Minor has no decisive evidence against it, but of the corresponding view that 2 Peter was likewise sent

from the same city, only at least 10 years later and to a different circle, the same cannot be said. The whole matter of Peter's presence in Rome at any time rests, it must be admitted, on a very insecure foundation. There is no positive evidence to that effect in the New Testament, and the earliest notice of Peter in early Christian literature (1 Clement, v) is equally indecisive. The next earliest notice (Ignatius, *Ep. ad Rom.*, IV, 3), about 110 A.D., is almost as vague. Later writers (Justin Martyr is a notable exception) generally represent Peter as having labored long and suffered martyrdom in Rome. While obviously unhistorical legends, such as those relating to his controversy with Simon Magus, have grown up in order to fill out a complete story, his residence in Rome for a longer or shorter period is usually accepted, not only by Roman Catholics, but by Protestant scholars of high rank. That he was martyred under Nero about the year 64 is probable, though not certain. Tradition relates that he met his death by crucifixion, but at his own request with his head downward, counting himself unworthy to suffer exactly in the same way as his Master. Roman Catholics reckon St. Peter as the first Bishop of Rome and the first Pope.

Bibliography. J. S. Howson, *Studies in the Life of St. Peter* (London, 1883); Felten, *Die Apostelgeschichte* (Freiburg, 1892); J. B. Lightfoot, *The Apostolic Fathers*, part i, Clement of Rome (London, 1890), id., "St. Paul and the Three," in his *Commentary on Galatians* (11th ed, ib., 1892); J. Schmid, *Petrus in Rom* (Lucerne, 1892); Sir W. M. Ramsay, *The Church in the Roman Empire* (London, 1893); id., *St. Paul the Traveller and the Roman Citizen* (ib., 1895); C. H. Fouard, *St. Peter and the First Years of Christianity* (Eng. trans., New York, 1900); A. S. Barnes, *St. Peter in Rome and his Tomb on the Vatican Hill* (London, 1900); W. H. Griffith Thomas, *The Apostle Peter* (ib., 1905); A. J. Southouse, *Making of Simon Peter* (New York, 1906); L. M. O. Duchesne, *Histoire ancienne de l'église* (Paris, 1908; Eng. trans., New York, 1909).

PETER I, ALEXEYEVITCH (1672-1725). Emperor of Russia from 1682 to 1725, generally known as Peter the Great. He was the son of the Czar Alexei Mikhailovitch by his second wife, Natalia Naryshkin, and was born at Moscow, June 9 (May 30), 1672. Peter's half brother Feodor, who succeeded his father in 1676, died without issue in 1682, having named Peter as his successor, to the exclusion of his own full brother, Ivan, a feeble-minded prince. The Grand Duchess Sophia, Peter's half sister, attempted to set aside this arrangement and to obtain control of affairs. To this end she brought about an insurrection of the Streltsi (q.v.), and after much bloodshed Ivan and Peter were crowned as joint rulers and Sophia became Regent (July, 1682). Peter's education was not carefully looked after, and at an early age he gave evidence of those stormy passions which were to characterize his entire life. In February, 1689, Peter married Eudoxia Feodorovna Lopukhin, and soon after he called upon his sister to resign the government. This she would not do without a contest, and Peter was forced to flee from the capital, but the foreigners in the Russian service, led by Lefort and by Patrick Gordon (q.v.), joined his party, and when the Streltsi deserted her the Regent yielded

and was shut up in a convent. On Oct. 11, 1689, Peter made his public entry into Moscow, where he was met by Ivan, to whom he gave a nominal precedence, reserving the sole exercise of power for himself. Ivan died in 1696. Peter grasped the value and significance of Western civilization much more thoroughly than any of his predecessors. He at once began the slow task of forming out of the barbarous and undisciplined material available an army on the European model. His ambitions were chiefly directed, however, towards creating a navy and developing the commerce of his country. Russia had little seaboard, being shut out from the Baltic by Sweden, which possessed Finland, Ingermanland, Esthonia, and Livonia, and from the Black Sea by Turkey, leaving only the White Sea and the Arctic Ocean, with the solitary port of Archangel, available for a Russian navy. Peter therefore set on foot what has become the established Russian policy, of seeking in every direction an outlet into ice-free seas. The Black Sea seemed to him to be the most available for a first move. He launched Russia upon her career of warfare against the Turks, and succeeded in making himself master of the city of Azov, at the mouth of the Don, in 1696. Peter brought in engineers, naval architects, and ordnance experts from Austria, Venice, Prussia, and Holland; built ships; improved the equipment and discipline of the army, and sent many of the young nobility to study in foreign countries. After repressing a revolt of the Streltsi in February, 1697, Peter put the administration into the hands of a council and left Russia in April, traveling as a subordinate member of an embassy, headed by Lefort, for the purpose of acquiring at first hand the knowledge necessary to develop his Empire. He thus visited the Baltic provinces, Prussia, and Hanover, and subsequently Holland, where at Amsterdam and Saardam he worked as a common shipwright. On the invitation of William III, King of England, he visited that country, remaining for three months. He left England in April, 1698, taking with him about 500 English engineers, surgeons, and artisans, and visited Vienna for the purpose of inspecting the Austrian army. His travels were cut short by a second revolt of the Streltsi, which necessitated his return to Russia in September, 1698. General Gordon had crushed the revolt, but Peter determined to be finally rid of this turbulent soldiery, and the organization was broken up and many of its members were executed. Peter divorced the Czarina Eudoxia, who with his sister Martha was suspected of complicity in the outbreak, which had been fostered by the Old Russian party. The process of introducing Western civilization continued. Printing and education were promoted, the calendar was partially reformed, and Western methods of enumeration were introduced. Systematic taxation of commodities was adopted as a source of revenue; foreign commerce was encouraged; and much of the Orientalism in dress, manners, and customs which had grown up during the Mongol supremacy gave place to the ways of the Occident. The Church was reorganized, its government being intrusted to the Holy Synod, of which the Czar was the head.

Having secured to Russia access to the sea on the south, Peter turned his eyes towards the Baltic, the possession of whose shores he determined to dispute with Sweden. That kingdom

since the time of Gustavus Adolphus had been the strongest military power in northern Europe. In 1700 Peter made an alliance with Sweden's enemies, Denmark and Poland, and threw down the gauntlet in the struggle for the Baltic supremacy. He was badly defeated by Charles XII at Narva, where his raw troops, although vastly superior in numbers, were wholly unable to cope with the Swedish veterans (Nov. 30, 1700). Peter was not disheartened. Taking advantage of the Swedes being employed elsewhere, he seized a portion of Ingermanland, in which he laid the foundation of the new capital, St. Petersburg (1703). Great inducements were held out to those who would reside in it, and in a few years it became Russia's commercial depot for the Baltic. For a long time in the contest with Sweden the Russians met with defeat, but Peter saw that reverses were administering to his troops a wholesome discipline. In 1709 Charles XII rashly invaded South Russia, and on July 8 his army was annihilated by the Czar at Poltava. This event marked the collapse of the Swedish power. In the following year Peter was master of Livonia. He now found himself at war with the Turks, whom Charles XII, who had taken refuge among them, had stirred up to hostilities. In 1711 Peter was caught in a trap on the Pruth and was forced to conclude the Treaty of Hush (July 23), by which he gave up the port of Azov and the territory belonging to it. On March 2, 1712, Peter's marriage with his mistress, Catharine (see CATHARINE I), was celebrated at St. Petersburg, and two months afterward the central government was transferred to the new capital. The war against Sweden was prosecuted with energy and success. In 1713 the Swedish general Stenbock was forced by the Danes, Saxons, and Russians to surrender at Tönning in Schleswig. About the same time the Russians made themselves masters of Finland, and in 1714 the Russian fleet overwhelmed the Swedes near the Åland Islands. In 1716 and 1717 Peter made another tour of Europe. In 1718 a widespread conspiracy looking towards the undoing of Peter's reforms was discovered and among those implicated was the Crown Prince Alexei Petrovitch (q.v.). Peter caused his son to be sentenced to death, but pardoned him later. The unfortunate prince, according to the most probable accounts, died in prison from the effects of the torture to which he had been subjected. In 1721 peace was made with Sweden, which surrendered to Russia Livonia, Esthonia, Ingermanland, Karelia, and a small portion of Finland, together with all the islands along the Baltic coast from Courland to Viborg. In the same year Peter assumed the title of Emperor of All the Russias. In 1722 Peter commenced a war with Persia in order to open the Caspian Sea to Russian commerce. Derbend and Baku were the fruits of this war. The last years of Peter's life were occupied chiefly in beautifying and improving his new capital and carrying out plans for the diffusion of knowledge among his subjects. In the autumn of 1724 he was seized with a serious illness, the result of his imprudence and habitual excesses, and after enduring much agony he died, Feb. 8 (Jan. 28), 1725.

Upon the political life of Russia Peter the Great left a powerful impress and he is regarded as the creator of modern Russia, which he definitely brought into the state system of

European nations. Peter the Great was a type of the benevolent despot of the eighteenth century, who sought to advance the progress of his people from above. The testament attributed to him, defining his policy, is probably spurious, but it doubtless expresses, with some elaboration, his ideas.

Bibliography. Benjamin Bergmann, *Peter der Grosse* (Königsberg, 1823-30); J. L. Motley, "Peter the Great," *North American Review* (October, 1845), a notable essay, since republished; Mintzlof, *Pierre le Grand dans la littérature étrangère* (St. Petersburg, 1872), containing bibliographical notes on 1200 works not Russian relating in some way to Peter; Alexander Brückner, *Peter der Grosse*, in the Oncken Series (Berlin, 1879); Eugene Schuyler, *Peter the Great* (2 vols., New York, 1884), one of the best biographies in English; Kazimierz Waliszewski, *Peter the Great*, English translation by Mary Lloyd (ib., 1900); John Barrow, *Life of Peter the Great* (ib., 1903); G. Cahen, *Histoire des relations de la Russie avec la Chine sous Pierre le Grand* (Paris, 1912); Pernet, *Pierre le Grand, mercantiliste* (ib., 1913). Among Russian works, mention should be made of Soloviev, Milioukov, and Philippov.

PETER II, ALEXEYEVITCH (1715-30). Emperor of Russia from 1727 to 1730. He was the son of Alexei, heir of Peter the Great, who died in prison. Peter II was born in St. Petersburg, Oct. 22 (11), 1715. In his childhood he was kept in seclusion and very much neglected. He ascended the throne on the death of Catharine I, May 17, 1727, and immediately fell under the influence of the ambitious Menshikoff, who affianced the youthful Czar to one of his daughters. Menshikoff, however, was soon overthrown by the Dolgoruki, who succeeded to his power. Peter was crowned in 1728, and in the following year was betrothed to a member of the Dolgoruki family. The marriage was set for Feb. 2, 1730, but a few days previously the Czar was stricken down by smallpox and died on February 9 (January 29). He was succeeded by Anna Ivanovna (q.v.).

PETER III, FEDOROVITCH (1728-62). Emperor of Russia in 1762. He was a grandson of Peter the Great by his daughter Anna, who was married to Duke Charles Frederick of Holstein-Gottorp, and was born at Kiel, March 3 (Feb. 21), 1728. The Empress Elizabeth Petrovna (q.v.) nominated him her successor to the throne after making him refuse the offer of the Swedish throne, much against his will. In 1745 he married Sophia Augusta, a princess of Anhalt-Zerbst, who, on entering the Greek church, assumed the name of Catharine. Peter succeeded Elizabeth on her death, Jan. 5, 1762. His first act of authority was to withdraw from the alliance with France and Austria against Prussia, restoring to Frederick II the Province of East Prussia, which had been conquered during the Seven Years' War, and sending to his aid a force of 15,000 men—a line of conduct which seems to have been prompted solely by his admiration for the Prussian sovereign. He also recalled many of the political exiles from Siberia, among whom were L'Estocq, Münnich, and Biron, Duke of Courland; abolished many of the oppressive police laws; abolished the secret office with its terrible system of espionage known under the name of word and deed; reduced taxation; initiated measures for the revival of Russian industries and commerce; and attempted

a reorganization of the army and navy. He also attempted to reconquer for the house of Holstein-Gottorp the portion of Schleswig which had been ceded to Denmark in 1713. Peter's pro-German tendencies, however, his liberal policy, his indifference to the Greek church, and his ill-concealed contempt for Russian manners and customs made him hated by his subjects. His wife had still deeper cause for dislike; for, though he was himself addicted to drunkenness and debauchery, he never ceased to reproach her with her infidelities, and had even planned to divorce her, disinherit her son Paul (q.v.), and elevate his mistress, Elizabeth Vorontsoff, to the throne. A formidable conspiracy, headed by Catharine and supported by the principal nobles, was formed against him. On the night of July 8, 1762, Peter was declared to have forfeited his crown, and his wife was proclaimed Empress as Catharine II by the guards, the clergy, and the nobility. Peter, who was then at Oranienbaum, neglecting the counsels of Field Marshal Münnich, who proposed to march at once on the capital at the head of the regiments which were still faithful, soon found even the opportunity of flight cut off, and was compelled to submit. He abdicated the throne on July 9, and on the 17th of the same month was put to death by Gregory Orloff to secure the safety of the conspirators. Consult R. N. Bain, *Peter III, Emperor of Russia* (London, 1902).

PETER I, KARAGEORGEVITCH (1846-). King of Servia. He was born at Belgrade in 1846. His grandfather was George Petrovitch, known as Kara (Black) or Czerny George (q.v.), who led the Servians in their struggle for independence against the Turks and in 1812 was recognized by the Sultan as Prince of Servia. Peter's father, Alexander, was elected Prince of Servia in 1842, to succeed Michael Obrenovitch, but in December, 1858, he was declared deposed by the National Assembly, and in the following month left the country. With him went Peter, who was put to school in Hungary, made frequent visits to Russia, and finally entered the French military school of Saint-Cyr. He was graduated there and became an officer in the French army. After the outbreak of the Franco-German war he served with distinction under Bourbaki, notably before Villersexel. Three times he was captured by the Germans and as often escaped. For several years he followed a life of extravagance and dissipation in Paris, and then, aroused by the troubles in the Balkans, actively encouraged the rising of 1875-76 in Herzegovina, which culminated in the Russo-Turkish War of 1877-78 and the complete establishment of Servian independence. After a period of roving he went to Montenegro and in August, 1883, married the Princess Zorka (born 1864), eldest daughter of Prince Nicholas. Eventually this marriage served to connect him with the Russian and Italian courts, since Zorka's sister Militza married the Grand Duke Peter Nikolaievitch and her sister Helena became the consort of Victor Emmanuel II. The permanent residence of Peter and Zorka was at Cetinje, but frequent visits to Paris were made. After Zorka's death (1890), Peter became estranged from his father-in-law and went to Geneva to educate there his three children, a girl aged five and two boys aged three and two. From that time until 1903, though a recognized pretender, he lived quietly in Switzerland. On June 11, 1903, King Alexander of Servia, of

the rival house of Obrenovitch (q.v.), and his Queen, Draga, were murdered, and four days later Peter was elected King of Servia by the Skupshtina. After an absence of 44 years he entered Belgrade on June 24 and on the following day took the oath of office. The accession of Peter had important international consequences, for, unlike his predecessor, he was opposed to Austro-Hungarian influences in his country and very favorable to Russia and to Pan Slavism. While loyally supporting constitutional government, he sympathized ardently with national aspirations for a greater Servia. Accordingly, he protested against the annexation of Bosnia-Herzegovina by Austria-Hungary in 1908 and against the action of the Dual Monarchy in depriving his country in 1912-13 of territory which was wrested from Turkey in the course of the Balkan War and which would have given Servia access to the Adriatic. From the resulting tension between Servia and Austria-Hungary proceeded the Great European War (1914 et seq.). In this war King Peter himself took the field with his army, just as did King Albert of Belgium. See **BALKAN WAR**; **SERVIA**; **WAR IN EUROPE**.

PETER, APOCALYPSE OF. See **APOCRYPHA, New Testament**.

PETER, EPISTLES OF. Two of the seven so-called Catholic Epistles of the New Testament.

1 Peter. This document, according to its address, signature, and closing paragraph (i. 1-3 and v. 12-14), is a letter from the Apostle Peter to the Christians of Asia Minor and sent thither by Silvanus, probably the Silas mentioned in Acts (xv. 22 et seq.). The Epistle was written to admonish and encourage those addressed to a cheerful, manly patience in persecution, to an orderly life, and to a steadfast hope. The doctrinal teachings are set forth incidentally to give the necessary foundation to the exhortations. The hortatory character of the Epistle makes it difficult to analyze satisfactorily. The following outline is suggested: after the usual address, signature, and salutation (i. 1-2), the author fervently expresses his praise to God for the Christian salvation, the object and end of their sorely tried faith, foreshadowed in prophecy and now eagerly awaited (i. 3-12). This prepares for the three series of exhortations that follow. In the first (i. 13-ii. 10) the readers are exhorted to earnestness, obedience, and holiness with godly fear in view of the cost of their redemption (i. 13-21), to the exercise of brotherly love, as all of one divine regeneration (i. 22-25), and to a vital union with Christ, the chief corner stone (ii. 1-10). The second series (ii. 11-iv. 11) urges to orderly life (ii. 11-12), to all due subjection to constituted authority, even if suffering should ensue, citing the example of such suffering set by Christ (ii. 13-25); then passes to exhort wives to reverence their husbands (iii. 1-7), adding a general exhortation to all to be orderly, forbearing, and forgiving (iii. 8-12). In case this loyalty involves suffering, let them remember Christ's vicarious suffering and its blessed results, conform their conduct to his, and place their faith in him, the risen Lord, especially since the end is near (iii. 13-iv. 11). The third set of exhortations (iv. 12-v. 11) pleads with those who are addressed not to take offense at the trials they are undergoing. If they are for loyalty to Christ, all is well. They must not suffer as evildoers (iv. 1-10).

The church officers and members are urged to faithful performance of duties (v. 1-7), and the final exhortation to watchfulness is followed by a benediction (v. 8-11). The Epistle closes with greetings from the church (or wife?) in Babylon and from Mark. A short benediction is added (v. 12-14).

The doctrinal teachings of 1 Peter, compared with those of the Pauline Epistles, are marked by a greater simplicity. They move within the sphere of Jewish-Christian thought and may be accounted for and explained on the basis of the application of the conviction that Jesus was the Messiah to the teachings of the Old Testament. The conception of God is that of the Old Testament, supplemented by the emphasis laid by Jesus on His Fatherhood (i. 3, 17). There is no distinctive Christology. Jesus is spoken of after the same manner as in the first chapters of Acts and in the Synoptic Gospels. The doctrine of redemption is fundamentally the same as that of Paul, but expressed differently, mainly in Old Testament language, and influenced largely by a deep appreciation of the human elements of Jesus' passion. The resurrection is the great fact that crowned the Messianic work of Jesus (i. 3, 11), and faith is fixed on that as well as on his death (iii. 22). The Christian life is founded on a vital union with the now living and glorified Jesus (i. 23-ii. 5). Salvation affects the real life, the soul (i. 9 et seq.), and begins here through the new birth by the agency of the Word (i. 23). It becomes a possibility through faith, a word of broad significance in 1 Peter, including the whole obedient response to the will of God expressed in the life and work of Jesus the Messiah. The positive teachings concerning salvation reveal strong convictions concerning sin and its seat in man's being. The eschatology of 1 Peter is simple. The future life is of far greater importance than this. We are only pilgrims here, and on that future we should fix our attention. It will be ushered in by a new revelation of Christ and will be an eternity full of glory (i. 7, 10; v. 10). The church organizations appear to have been still quite elementary. Elders are at the head and the younger element are urged to obey the older. As to baptism, not the form, but the heart condition is the important element (iii. 21).

The Epistle has been subjected to severe criticism. The central question is that of its genuineness. Is it what it purports to be? The external evidence in its favor is remarkably strong. All the prominent writers at the end of the second century, as well as Papias and Polycarp, early in the second century, used it as Peter's. No doubt as to its genuineness was expressed in the ancient Church.

The internal evidence in favor of Peter's authorship may be stated as follows: (1) The opening and closing sections, in which the writer calls himself the Apostle Peter, addresses a specific circle of Christian communities, mentions by name Silvanus, the writer (i.e., amanuensis), and probably also the bearer, and sends greetings from Mark. Both Silvanus and Mark were fellow workers with the Apostles and members of the primitive Christian community of Jerusalem. If these sections state the truth, the genuineness of the Epistle must be admitted. If they are to be rejected as fictitious, strong grounds must be given for the rejection. (2) Incidentally and without undue display the

writer represents himself as one who was an eyewitness of Jesus' ministry and passion (cf. i. 8, v. 1, and the warm-hearted way in which Jesus' sufferings are spoken of). (3) The independent character of the thought of the Epistle is, at least, not against its genuineness. The brief sketch of the teachings of the Epistle given above reveals this. While the writer comes close to Paul's language at times, he is no mere echo of Paul nor is he a blundering copyist. (4) There is a genuine and serious tone and purpose to the Epistle, exhorting its readers to all that is good, which makes it difficult to account for as a forgery.

The main objections to Petrine authorship based on internal evidence are: (1) The trials or persecutions referred to imply a date later than the end of Peter's life. In regard to this it may be said that the statements in the Epistle do not imply a regularly organized state persecution of Christians as such. The general opposition of the pagan world and of the Jewish element are sufficient to account for all that is said. That this opposition was severe in apostolic days the letters of Paul (cf. especially 2 Cor. xi. 23 ff.) and the record in Acts abundantly testify. It is not necessary to presuppose even the persecution of Nero as implied in the Epistle. Such a passage as ii. 13 et seq. does not point that way. (2) The Epistle is said to manifest great dependence on Paul's writings, which, it is thought, militates strongly against Petrine authorship. In regard to this it may be replied: (a) There is no inherent impossibility in the supposition that Peter may have known and valued Paul's writings and used expressions from them in a writing of his own. (b) It is probable that a linguistic relationship exists between our Epistle and Romans and Ephesians, but the exact nature of this relationship is not easy to determine. The similarities are not close enough to be called quotations. There is also the probability of a large stock of common phraseology current in early Christian circles, which, while it may well have had Paul as one of its chief sources, was not necessarily dependent on the reading of Paul's Epistles for its dissemination. (c) In any case the author of 1 Peter is master of his own thought and language. In this short Epistle he uses at least 60 words not found elsewhere in the New Testament, and gives to many common words a special, peculiar sense. (3) The Greek of 1 Peter is said to be of a quality far beyond the capability of Peter, an ignorant Galilean fisherman. But the fact is, we know nothing of Peter's knowledge of Greek. That language was largely spoken in Galilee, and Peter may have gained some proficiency in it. He seems, however, to have used Silvanus to write the Epistle, dictating the matter and leaving the writer to put it into finished form. This supposition, which has its support in the Epistle itself (cf. v. 12), may also go far towards solving the linguistic relation between 1 Peter and Paul's Epistles as Silvanus had been, for years previously, one of Paul's most intimate followers.

We may affirm, then, that the general character of the Epistle and its history in the Church are not opposed to its own claim to be an epistle of the Apostle Peter. It only remains to consider the questions of destination and date. The plain, literal sense of the words, "to the elect sojourners of the dispersion," etc., in-

dicates Jewish-Christian communities in the various provinces of Asia Minor as the parties addressed. The main objections to this view are that, according to Acts and Paul's Epistles, the Christianity of Asia Minor was overwhelmingly Gentile-Christian, and that no epistle addressed to Jewish-Christians would have used such language as we find in i. 18 and iv. 3-4. These objections are strong, though not conclusive. The work of Paul covered half of the territory indicated in the address, and many Jewish-Christian workers may have labored in north-eastern Asia Minor and even in the regions traversed by Paul. The second objection is more serious, but it cannot be said that Peter could not have used such language in addressing churches which, though composed mostly of Jewish Christians, still contained some converts from paganism.

It is better, however, to take the word "dispersion" in a figurative sense and consider that the Epistle was addressed to Christians as such, whether of Jewish or of pagan ancestry. In some parts of Asia Minor the former may have predominated; in other parts, especially in the western districts, the latter. It was only natural that the Apostle, himself a Jewish Christian whose experience had been mainly with Jewish Christians, should address them all as the true Israel. Since Paul had evangelized only a part of Asia Minor, an epistle addressed to churches scattered through the whole vast province had no occasion to mention him. It is probable that by Babylon (v. 13) Rome is intended. Whether the term "fellow elect" (fem.) means the church or some individual (the writer's wife?) is a question.

The date to be assigned to the Epistle depends mainly on the answers to two questions: (1) To what do the references to suffering point? If nothing less than a state persecution is implied, the time of the persecution by Nero is the earliest possible date—i.e., c.64 A.D. If no state persecution is implied, the Epistle may well have been earlier. (2) The question of the relation between 1 Peter and the Pauline Epistles. If 1 Peter has borrowed directly from Romans and Ephesians, it must be dated later than Ephesians, i.e., on the ordinary theory, later than about 60, when Paul was a prisoner in Rome. Most critics who hold to the genuineness of the Epistle and to its dependence on Paul are inclined to a date near 64 A.D. But if, as has been suggested above, the relation between 1 Peter and the Pauline Epistles is not such as to suggest direct borrowing, then no conclusions regarding the date of 1 Peter can be reached along this line. Ramsay (*The Church in the Roman Empire*, pp. 279-295, Oxford, 1893) advocates 80 A.D. Those who dispute Peter's authorship assign different later dates. The Epistle, if written at Rome, was, presumably, written when Peter was at Rome, and regarding this we have no certain information and here the case must rest for the present.

2 Peter. This Epistle purports to be from the Apostle Simon Peter to (an unnamed circle of) Christians. After exhorting them to fulfill their high destiny by a complete, well-developed Christian life (i. 3-11), he declares his purpose ever to remind them of these things, especially as he knows that his death is near, and is certain of the truth of the doctrines of the power and second coming of Christ (see **SECOND ADVENT OF CHRIST**), both from his own

experience at the Transfiguration and from the more sure word of prophecy (i. 12-21). He then passes to his main theme, warning against the threatened inroads of false teaching represented by bold, irreverent, reckless Antinomianism and by a skeptical denial of the second coming (ii. 1-iii. 13). The Epistle closes with a reference to Paul as teaching the same truths, though often misunderstood, and by an exhortation to constant Christian growth (iii. 14-18).

Unlike 1 Peter, this Epistle seems to have been called forth by some very urgent conditions in certain Christian communities. Its scope is not so broad nor its teachings so diversified as is the case with 1 Peter. Only in the very condensed passage i. 3-11 is a comparison between the two Epistles possible.

Because of its somewhat unique character, 2 Peter has proved an inviting field for biblical criticism, and the questions of its authorship, date, and destination are still open. The external attestation to the Epistle is probably weaker than in the case of any other New Testament writing. There is no distinct trace of its existence before Origen, though it is probable that it was commented on by Clement of Alexandria (c.190). We must then be content with such evidence as the Epistle itself offers. Petrine authorship is, without doubt, claimed, not only in the opening words, but in the reference to the Apostle's death as revealed by the Lord (i. 14), in the reference to the Transfiguration (i. 16), and in the notice of Paul's letters (iii. 15). Nevertheless grave objections may be made against this claim. For one thing, the implication in iii. 14 ff. that Paul's letters were already collected and of canonical (or at least semicanonical) standing makes a date within the limits of Peter's lifetime practically impossible in view of what we know of the history of the New Testament canon. Arguments drawn from the vocabulary and style of the Epistle are not of great weight, because of our imperfect knowledge of Peter's habits and circumstances. The remarkable, almost verbal similarity between 2 Peter ii. 1-iii. 3 and the short Epistle of Jude demands explanation. If, with most modern scholars, we hold that this section of the Epistle shows dependence on Jude, it becomes very difficult to maintain the apostolic authorship of 2 Peter, not only on general grounds, but also because the errorists combated are spoken of in Jude as already in the community, while in 2 Peter their appearance is still future, or at least indicated as very recent. The marked dissimilarity in many respects between 1 and 2 Peter is also a strong argument against identity of authorship. The relation between 2 Peter and apocryphal writings of Josephus is too uncertain for a basis of argument.

On the whole, it seems best to consider 2 Peter a pseudepigraph (like the so-called Gospel and Apocalypse of Peter), written "with a view of commending to the Christian reader views which he [the author] regarded as important and which he believed to be in accordance with St. Peter's teaching" (Mayor.)

Bibliography. The recent and able commentaries by Kühl, in Weiss's series (Göttingen, 1897), H. von Soden, in the Holtzmann Series (Leipzig, 1899), and Charles Bigg, in International Critical Commentary Series (New York, 1901), are full and leave little to be desired; also J. R. Lumby, "Epistles of St. Peter,"

in *Expositor's Bible* (ib., 1893), and J. H. Jowett, *Epistles of St. Peter* (ib., 1905). Chase, in the *Hastings' Dictionary of the Bible* (new ed., New York, 1909), gives an exhaustive treatment with a good bibliography. For the theology of 1 Peter, consult the standard New Testament theologies of Weiss, Beyschlag, Holtzmann, Stevens, and also Weiss, *Der petrinische Lehrbegriff* (Berlin, 1855). The various introductions to the New Testament, in particular the more recent ones of Theodor Zahn (Eng. trans., New York, 1909) and J. B. Moffatt (ib., 1911), and works on the apostolic age contain full discussions of the critical problems. For 2 Peter, consult also F. Spitta, *Der zweite Brief des Petrus und der Brief des Judas* (Halle, 1885), and especially J. B. Mayor, *The Epistle of St. Jude and the Second Epistle of St. Peter* (New York, 1907).

PETER, GOSPEL OF. See APOCRYPHA, *New Testament*.

PETER, pä'tër, HERMANN (1837-1914). A German classical scholar, son of K. L. Peter, best known for his work in Roman history. He was born at Meiningen, studied at Bonn and Breslau, and taught at Posen, Frankfort-on-the-Oder, and at Meissen, where he was rector of the school from 1874 to 1905. His works include important editions of *Scriptores Historiæ Augustæ* (1865; 2d ed., 1884) and critical essays on the same subject (1892); *Historicorum Romanorum Reliquiæ* (2 vols., 1870, 1906; vol. 1 in 2d ed., 1913); *Historicorum Romanorum Fragmenta* (1883), as well as Ovid's *Fasts* (1874; 3d ed., 1899); and the critical essays *Die Quellen Plutarchs in den Biographien der Römer* (1865) and *Die geschichtliche Litteratur über die römische Kaiserzeit bis Theodosius I. und ihre Quellen* (1897).

PETER, HUGH. See PETERS, HUGH.

PETER, PREACHING OF. See APOCRYPHA, *New Testament*.

PETER BELL. A tale in verse by William Wordsworth (1819), of exaggerated simplicity.

PETERBORO. A town in Hillsborough Co., N. H., 40 miles by rail southwest of Manchester, on the Boston and Maine Railroad (Map: New Hampshire, F 8). It contains a public library that was founded in 1833 and a historical society. A colony of art and music students has been established here and also a society of handicraft workers. There are cotton mills and basket factories. The water works are owned by the town. Pop., 1900, 2527, 1910, 2277.

PETERBORO MUSIC FESTIVAL. Shortly after the death of Edward MacDowell (q.v.) a number of admirers organized the MacDowell Memorial Association in 1908, and the composer's widow deeded to them the master's summer residence at Peterboro, N. H. At first rooms were rented for the summer, at very moderate rates, to composers who sought inspiration in the beautiful surroundings. This plan met with so much favor that soon the applicants could not be accommodated in the house and cottages began to be built. In 1910 Mrs. MacDowell conceived the idea of a pageant in memory of her husband. Prof. G. P. Baker of Harvard University superintended the scenic representation, while the arrangement of the music was in the hands of Chalmers Clifton. He selected appropriate music from the works of MacDowell and arranged the same for orchestra. The success of this pageant was so pronounced that it was decided to hold a similar festival an-

nually in the month of August. Each festival is of four days' duration, consisting of a pageant and a number of concerts. The vast majority of the works performed are by native composers, and not a few of the novelties are composed in the colony itself. From their beginning these festivals occupied a place of importance in the history of music festivals in the United States.

PETERBOROUGH. An episcopal city, a parliamentary and municipal borough, and a civic county, known as the soke or liberty of Peterborough, in Northamptonshire, England, on the Nene, 76 miles north by west of London (Map: England, F 4). Its principal edifice is the famous cathedral of St. Peter, which has undergone complete restoration since 1883 and holds a high rank among English cathedrals, exhibiting the eight grades of transitional architecture from Norman to Perpendicular. The south transeptal crypt incloses the site of the prior cruciform Saxon church. The west front as a portico is said to be the finest in Europe. A central tower, lantern-shaped, rises at the intersection of the nave and transept. The length of the cathedral is 476 feet; breadth at the great transepts, 203 feet; height of central tower from the ground, 150 feet. The town is regularly laid out, has an excellent endowed grammar school of the sixteenth century, a public library, a school of art, science, and technology, a college for training schoolmasters, a corn exchange in the Italian style, a jail and house of correction, a handsome parish church, and a number of charitable institutions. The city owns its water and electric-lighting works, markets, sewage farm, bathing place, and isolation hospital, maintains parks and recreation grounds, and provides cottage allotments. Peterborough is an important railway centre and carries on an active trade in corn, coal, timber, bricks, building stone, and malt. It has also manufactures of agricultural implements and extensive locomotive works and railway repair shops.

Anciently named Medeshamstede, the city had its origin in a great Benedictine monastery, founded in 655. This monastery, reared in honor of St. Peter, became one of the wealthiest and most important in England, but it was not until after being destroyed by the Danes in 807 and rebuilt about 966 that the town was called Peterborough. On the dissolution of the monasteries the magnificent cathedral was spared, owing, it is supposed, to its containing the remains of Queen Catharine of Aragon, but it was vandalized by Cromwell and his troopers in 1643. Pop., 1801, 3400; 1851, 8700; 1901, 30,872; 1911, 33,574. Consult: G. A. Poole, *Peterborough* (London, 1881); Davys, *The Cathedral and Abbey of Peterborough* (Peterborough, 1886); W. D. Sweeting, *Cathedral Church of Peterborough*, in Bell's "Cathedral Series" (London, 1899).

PETERBOROUGH. A city and the capital of Peterborough Co., Ontario, Canada, on both sides of the Otonabee River and on the Canadian Pacific and the Grand Trunk railroads and the Trent Canal, 76 miles northeast of Toronto (Map: Ontario, G 5). The town is the centre of a picturesque lake and river district and is a favorite resort for sportsmen. It is the seat of a Roman Catholic bishop. Besides the cathedral and several fine churches, the city possesses a provincial normal school, a collegiate institute, a public library, fine munic-

ipal buildings, and four parks. The hydraulic lift lock on the Trent Canal is one of the largest in the world, the height of lift being 65 feet, and the height of the guide towers being 100 feet from the foundation. The city is one of the largest Canadian centres of electrical development and has many manufacturing establishments, including lumber and flour mills, pork-packing plants, and manufactories of agricultural implements, harness, cereal foods, electric machinery and supplies, canoes, locks, shovels, clothing, carpets, tents and sails, dairy machinery, yarn, steel sashes, marble products, aerated waters, silk labels, furniture, bricks and tiles. Gold, silver, lead, mica, and iron are found in the vicinity. The value of the manufactured output in 1910 was \$10,633,119, as compared with \$3,789,164 in 1900, being an increase of 180.62 per cent. A United States consular agent resides here. The city owns its water works. Pop., 1901, 11,239; 1911, 18,360; 1915 (local est.), 23,500.

PETERBOROUGH, CHARLES MORDAUNT, third EARL OF (1658-1735). An English military and naval commander. He served as a boy in the navy and then entered the army. For the prominent part that he took against James II he was made Earl of Monmouth by William III, succeeding afterward to the earldom of Peterborough, as heir to his uncle, and was made Privy Councillor and First Lord of the Treasury, but his efforts to secure the passage of a bill providing for triennial parliaments led to a breach with the King, and in 1697 he was deprived of his offices and was for several months a prisoner in the Tower. During the War of the Spanish Succession the English expedition to the Iberian Peninsula was placed under his command, and in June, 1705, he arrived in Lisbon with 5000 Dutch and English soldiers. After taking on board the Archduke Charles of Austria, who claimed the Spanish crown, the armament proceeded to Valencia. Mordaunt conceived the idea of making a dash at Madrid and finishing the war at one blow, but was overruled by the Archduke and the Prince of Hesse and compelled to besiege Barcelona, which was defended on one side by the sea and on the other by the strong fortifications of Monjuich. By a coup de main he made himself master of Monjuich, Barcelona fell, and Mordaunt pushed his successes into the interior. Several towns submitted. He marched to Valencia and at the head of 1200 men defeated a Spanish force of 4000. The Spaniards sent a large army into Catalonia, and a French fleet appeared off Barcelona. Mordaunt returned to Barcelona, harassed the enemy's army, and, putting himself on board the English squadron, directed a movement which compelled the Frenchmen to put to sea, and Barcelona was saved. Mordaunt again wished to march towards Madrid, but his plan for gaining possession of the capital was once more rejected by Charles. He accordingly left the army in a fit of pique and went to Italy. In 1707 he returned to Valencia as a volunteer, but the excellent advice he gave was not followed. He was recalled to England, and from that moment the tide of fortune ran strong against the Austrian cause. On his return he made common cause with the Tories and received the Garter and other dignities for his services. On the accession of George I he received the appointment of commander in chief of the naval forces of Great Britain. He died

at Lisbon. Brilliant and versatile, he was also eccentric and erratic. His witty yet affectionate letters to Pope, Swift, Prior, etc., give a fine insight into his private character. His character has been sketched by Horace Walpole, in his *Catalogue of Royal and Noble Authors*, and with still greater force and picturesqueness by Macaulay. Attempts have been made to discount the brilliancy of his leadership in the Spanish campaign and to attribute the successes to other officers, but these have signally failed. Consult: George Warburton, *Memoirs of Charles Mordaunt, Earl of Peterborough and Monmouth* (London, 1853); F. S. Russell, *Memoir of Charles Mordaunt, Earl of Peterborough* (ib., 1887); William Stebbing, "Peterborough," in *English Men of Action* (ib., 1890); F. E. Cooper, "Peterborough," in Spenser Wilkinson's *From Cromwell to Wellington* (ib., 1899).

PETER CLAVER, SAINT (1580-1654). The apostle of the negroes in Spanish America. He was born in Catalonia of a noble family. After completing his education in the Jesuit college at Barcelona, he joined the novitiate of the society at Tarragona in 1602 and was sent to the newly founded college at Majorca. While he was still pursuing his studies, the general, Aquaviva, called for an approved missionary from each Spanish province of the society to go to the newly formed province of Granada in South America. Peter Claver was among those chosen and arrived at Cartagena, then the centre of the African slave trade, in 1610. In 1616 he was ordained and entered on his special work. He won the approval of the authorities for his plan and secured orders that no slave owners should be allowed to carry off the newly imported blacks until they had had instruction in the Christian faith. He signed himself the "slave of the negroes forever" and practically lived among them, on shipboard and in the hospitals, especially the leprosy hospital, ministering to their wants as well temporal as spiritual. His exertions during the plague in Cartagena resulted in utter exhaustion and paralysis, and he died Sept. 8, 1654. He was beatified by Pius IX in 1850 and canonized by Leo XIII in 1888. Consult P. B. G. Fleuriot, *Saint Pierre Claver, apôtre des nègres* (rev. ed., Paris, 1888), and F. Höver, *Der heilige Peter Claver, Apostel der Neger und Carthagenas* (Dülmen, 1888).

PETER DE KEMPENEER. See KEMPENEER, PETER DE.

PETER DE VINEA (c.1190-1249). An Italian statesman and jurist, born at Capua. By his abilities he attracted the attention of Emperor Frederick II, and as early as 1225 he appears as occupying a high judicial position in Frederick's Kingdom of Sicily. He soon became the chief judicial officer in the realm and aided in drawing up the constitution of 1231 for Sicily, which was far in advance of any other instrument of government of western Europe at that period. After filling other very high offices Peter was suddenly arrested on suspicion of having been bribed to poison the Emperor. It is said that, in order to avoid torture and further disgrace, he dashed out his brains against a pillar to which he had been chained. Dante has sought to clear his good name, and many beautiful legends arose concerning the tragic fate of the great statesman. His letters, poems, and speeches are some of the most useful sources for the history of his time. Con-

sult: J. L. A. Huillard-Bréholles, *Vie et correspondance de Pierre de la Vigne* (Paris, 1865); Salvatore Presta, *Pierre delle Vigne* (Milan, 1880); Copasso and Janelli, *Pietro della Vigna* (Caserta, 1882); Eduard Winkelmann, *Kaiser Friedrich II* (2 vols., Leipzig, 1889-97); Pasquale Villari, *Medieval Italy* (Eng. trans. by Costanza Hulton, London, 1910).

PETERHEAD. A seaport, a parliamentary, and municipal burgh of Aberdeenshire, Scotland, 44 miles northeast of Aberdeen (Map: Scotland, G 2). It is situated at the mouth of the Ugie River, on the most easterly point in Scotland. Keith Inch, the head of the peninsula and the nucleus of the town, occupied by fish-curing establishments, is now separated by a canal which connects the three spacious harbors of Peterhead, which have a combined area of 21 acres and two graving docks. The town is irregularly built, clean, and paved with the reddish granite named after the town. There is a parish church, a museum, and an art gallery. There are many churches, an academy and other schools, and libraries. The town owns its water supply, winter and summer baths, and a municipal lodging house. Formerly the chief British depot of the whale and seal industry, it is now noted for its herring fisheries, which employ over 500 boats and 5000 persons. The general trade is of considerable importance. The chief exports are herrings, cattle, agricultural produce, and granite. Carving and polishing granite, ship and boat building, woolen manufacture, and brewing are carried on. Peterhead dates from the thirteenth century. The Pretender landed here on Dec. 25, 1715. Pop., 1901, 11,750; 1911, 13,613.

PETERHOF, pā'tēr-hōf. A town in the Government of St. Petersburg, Russia, situated on the Gulf of Finland, 18 miles west of the capital (Map: Russia, C 3). It is a well-laid-out town, occupied chiefly by fine villas and summer residences, which extend along the gulf of Oranienbaum (q.v.) on the west and St. Petersburg on the east. The royal palace, with its extensive gardens, fountains, and statues modeled after those at Versailles, was begun by Peter I in 1711 and has since been greatly extended and embellished by the successive monarchs, especially by Elizabeth, Catharine II, and Nicholas I. It contains many rare works of art. Peterhof is now one of the most fashionable resorts around the capital, and the Russian court usually spends there a part of the summer. Pop., 1897, 11,300; 1911, 15,917.

PETERHOUSE. See ST. PETER'S COLLEGE.

PETER IB'BETSON. A novel by George Du Maurier (1891). It appeared serially in *Harper's Magazine* of that year.

PETER LOMBARD, or PETER THE LOMBARD (c.1100-c.84). An Italian theologian. He was probably born at Lumello in Lombardy. He studied at Bologna, Rheims, and later at Paris, where he was a pupil of Abélard. He became teacher of theology in the cathedral school of Notre Dame and in 1159 was appointed Bishop of Paris. He resigned the see after a year and died at Paris between 1160 and 1164. He was very generally styled Magister Sententiarum, or Master of the Sentences, from his compilation *Sententiarum Libri IV*, a collection of sentences from Augustine and other Fathers on points of Christian doctrine, with objections and replies also collected from authors of repute. It was

intended as a manual for the scholastic disputants of his age and as such was used for 500 years and made the basis of innumerable lectures and treatises. It was one of the first books printed, and many editions have been issued. It is found in Migne, *Pat. Lat.*, vols. exci-excii, with his *Catena* on the Psalms and on Paul's Epistles. Consult: Protois, *Pierre Lombard, son époque, sa vie, ses écrits, son influence* (Paris, 1881); J. Kögel, *Petrus Lombardus in seiner Stellung zur Philosophie des Mittelalters* (Leipzig, 1897); Adolf Harnack, *History of Doctrine*, vol. vi (Eng. trans. by Neil Buchanan, Boston, 1899); De Ghellinck, "The Book of Sentences," in *Dublin Review* (Dublin, 1910).

PETERLOO MASSACRE (fanciful name, suggested by *Waterloo*). The name popularly given to the dispersal of a large meeting by armed force in St. Peter's Field, Manchester, England, Monday, July 16, 1819. The assembly, consisting chiefly of bodies of operatives from different parts of Lancashire, was called to consider the question of parliamentary reform, and particularly to elect a representative in Parliament. The operatives had been drilling for some time prior to the meeting and assembled armed with sticks. The county magistrates resolved not to interfere until all were assembled and then to arrest the leaders. They had at hand six troops of the Fifteenth Hussars, several companies of infantry, and a small body of yeomanry, besides special constables. At the order of one of the magistrates the troops, supported by some of the yeomanry, charged and dispersed the mob, killing five or six and wounding a considerable number.

PETERMANN, pā'tēr-mān, AUGUST (1822-78). A German geographer. He was born at Bleicherode in Prussian Saxony and studied in Potsdam under Professor Berghaus in the geographical academy. There he worked upon Berghaus's *Physikalischer Atlas* and drew the map for Alexander von Humboldt's *Asie Centrale*. In 1845 he went to Edinburgh as assistant to A. K. Johnston in the preparation of his *Atlas of Physical Geography*, based upon the publication of Berghaus. In 1847 Petermann founded a cartographic establishment at London and was elected to the Royal Geographical Society. He then made a special study of the geography of Africa and of the Arctic Zone. In 1854 he returned to Germany to assume the directorship of Justus Perthes's geographic institution at Gotha and in 1855 founded the *Mitteilungen*, a monthly geographical journal, which remains the authoritative publication in its particular department. Like his father and his brother before him, he died by suicide.

PETERMANN, JULIUS HEINRICH (1801-76). A German Oriental scholar. He was born at Glauchau, was educated at Leipzig and Berlin, and studied Armenian at Venice. In 1837 he became professor of Oriental languages at the University of Berlin. From 1852 to 1855 he traveled through Asia Minor and Persia, in 1867-68 through Palestine and Syria; during the latter year he was German Consul at Jerusalem. Petermann published grammars of the Samaritan, Aramaic, and Armenian languages in the *Porta Linguarum Orientalium* series. Among his other works are *Reisen im Orient* (1860-61) and an edition of the *Samaritan Pentateuch* (1872 et seq.), continued after his death by Vollers.

PETER MARTYR. The name commonly given to **PIETRO MARTIRE DI ANGHIERA** (or **ANGHERA**) (c.1457-1526), an Italian writer on American history. He was born at Arona in northern Italy. In 1477 he went to Rome, where he secured the position of secretary to Francesco Negro, the Governor of the city, which he held until August, 1487, when he was induced to go to Spain by the retiring Spanish Ambassador, the Count of Tendilla. There he seems to have quickly become a chronicler, and in this capacity he came under the immediate protection of the Queen. In 1494 he was ordained as a priest and became tutor to the children of Ferdinand and Isabella. In 1501 he was entrusted with a diplomatic mission to the Sultan of Egypt, who had threatened to massacre all Christians in his domains in revenge for the expulsion of the Moors from Spain. Martyr's account of his successful visit to Cairo is narrated in his *Legatio Babylonica*, which he dedicated to Pope Leo X. In 1505 he also obtained the post of dean of the chapter of the cathedral of Granada, which he held until his death. In 1520 he was appointed royal chronicler and subsequently a member of the Council for the Indies. His principal works are the history of the New World, *De Rebus Oceanicis et Novo Orbe Decades*, and the *Opus Epistolarum*. The *Decades* constitute an important source for the early period of American discovery. The *Opus* is an invaluable collection of 816 letters dealing with contemporary events. Consult J. H. Mariéjol, *Un lettré italien à la cour d'Espagne, 1488-1526: Pierre Martyr d'Anghera, sa vie, ses œuvres* (Paris, 1888); J. Bernays, *Petrus Martyr Anglerius und sein Opus Epistolarum* (Strassburg, 1891); J. B. Thacher, *Christopher Columbus and Essay on Peter, Martyr of Anghera* (New York, 1903-04).

PETER MARTYR. A sixteenth-century religious reformer. See **VERMIGLI**.

PETER OF BLOIS, blwä (c.1135-c.1208). An English prelate and author, born at Blois of a Breton family, and well educated at Paris and Bologna. For two years he was tutor to William II of Sicily and keeper of the royal seal, and about 1173 entered the employ of Henry II of England, who sent him to Paris and to Rome. Peter became secretary to the Archbishop of Canterbury in 1176, a post he continued to hold under Baldwin, who succeeded to the see in 1184 and in whose behalf he was employed at Rome for a time. After the death of Henry II Peter acted (1191-95) as secretary to Queen Eleanor. He had been appointed archdeacon of London in 1192, and, if he be identified with the canon of Ripon bearing the same name, must have lived as late as 1208. He was a vain and ambitious man, well versed in Latin and a very able secretary, as he could dictate three letters and write a fourth himself simultaneously. Among his many works the *Epistles*, published in 1480 at Brussels, are the best.

PETER PAN. A play for children by Sir James M. Barrie (1904), produced in New York Nov. 6, 1905, with Maude Adams in the title rôle. The story appeared first in *The Little White Bird* (1902), also in *Peter Pan in Kensington Gardens* (1906) and in *Peter and Wendy* (1911).

PETERS, pät'sers, CARL (1856-). A German traveler. He was born at Neuhaus in Hanover, and studied at Göttingen, Tübingen, London, and Berlin, where in 1880 he became

privatdozent. In 1884 he founded the German Colonization Society, in whose interests he traveled through East Africa. Returning to Germany in 1885, he became the head of the German East African Company and two years later went again to Africa to assume the management of the colonial possessions. In 1888 he took the leadership of an expedition for the relief of Emin Pasha, marched up the Tana River to its source, and penetrated finally to the Victoria Nyanza. He crossed the lake in June, 1890, and met Emin, already rescued by Stanley. In February, 1891, he was sent as Imperial Commissioner to East Africa, founded a station at Kilimanjaro, and was active in the settlement of the boundary between German and English possessions. Accusations of cruelty towards the natives were in 1896 preferred against him. They were investigated before a judicial commission of the Reichstag and resulted in his dismissal. In 1898 he went to London and formed a company for the exploration of the gold fields of Rhodesia, and he himself revisited Africa in 1900 and again in 1905. In 1914 he returned to Berlin. He wrote: *Die deutsche Emin Pascha Expedition* (1891); *Das goldene Ophir Salomos* (1895), *Aequatorial- und Südafrika nach emer Darstellung von 1719* (1895), *Im Goldlande des Altertums* (1902, Eng. trans., *The Eldorado of the Ancients*, 1903), *England und die Engländer* (1904, 2d ed., 1905; Eng. trans., *England and the English*, 1904); *Die Gründung von Deutsch-Ostafrika* (1906); *Zur Weltpolitik* (1912).

PETERS, CHRISTIAN AUGUST FRIEDRICH (1806-80). A German astronomer, born in Hamburg. He studied at Königsberg, was employed in the Altona Observatory, and in 1839 was appointed assistant at Pulkova. Ten years after, Peters became professor at Königsberg and in 1854 was appointed director of the observatory at Altona and undertook the editorship of *Astronomische Nachrichten*. He went to Kiel in 1872, when the observatory was transferred thither, and in 1873 he was chosen professor of astronomy in the university of that place. His work was almost entirely on stellar astronomy and dealt especially with stellar parallaxes, the constant of nutation, and the study of Sirius. In addition to many papers contributed to the astronomical journals, he wrote also *Populare Mitteilungen aus dem Gebiet der Astronomie* (1860-69).

PETERS, CHRISTIAN HEINRICH FRIEDRICH (1813-90). A German-American astronomer, born at Koldenbüttel in Schleswig. He studied in Berlin, worked in the observatories of Copenhagen and Göttingen, then under Sartorius von Waltershausen in the survey of Etna, and in the topographic bureau of Naples, and in 1854 went to the United States. For several years he was employed on the coast survey and in 1858 was appointed professor of astronomy at Hamilton College and director of the Litchfield Observatory. His greatest services to astronomy were the discovery of about 50 comets and planetoids, and the stellar charts published in 1882. Peters led the United States expedition to New Zealand for the observation of the transit of Venus in 1874.

PETERS, or **PETER**, HUGH (1598-1660). An English Independent minister and author. He was educated at Cambridge, was ordained, and preached at the church of St. Sepulchre, London, until he was silenced for nonconfor-

mity; he went to Rotterdam and became pastor of the Independent church. He was in New England from the winter of 1635-36 to 1641; was settled pastor of the First Church in Salem, Mass., as successor of Roger Williams. As chaplain in the Parliamentary army he rendered unusual services, for which he was rewarded under the Commonwealth and the Protectorate. After the Restoration, being suspected of complicity in the King's death, he was indicted for high treason, condemned, and beheaded, Oct. 16, 1660. During his imprisonment he addressed to his daughter, Elizabeth, *A Dying Father's Last Legacy to an Only Child*. He published, among other works: *Peter's Last Report of the English Wars* (1646); *A Word for the Army and Two Words for the Kingdom* (1647); *Good Work for a Good Magistrate* (1651); and several other pamphlets. Consult J. B. Felt, *Memoir and Defense of Hugh Peters* (Boston, 1851).

PETERS, JOHN PUNNETT (1852-). An American Episcopal clergyman and Orientalist, born in New York City. He graduated at Yale (1873) and studied at Berlin and at Leipzig. He was professor of Old Testament languages and literature at the Protestant Episcopal Divinity School in Philadelphia (1884-91) and professor of Hebrew at the University of Pennsylvania (1885-93) and from 1888 to 1895 conducted excavations at Nippur. He became rector of St. Michael's Church, New York, in 1893, and from 1904 to 1910 he was also canon residentiary of the cathedral of St. John the Divine. He wrote, *Nippur, or Explorations and Adventures on the Euphrates* (2 vols., 1897); *The Old Testament and the New Scholarship* (1901); *Early Hebrew Story: Its Historical Background* (1904); *Annals of St. Michael's, New York, for One Hundred Years, 1807-1907* (1907); *Modern Christianity* (1909); *Jesus Christ and the Old Commandments* (1913); *The Religion of the Hebrews* (1914).

PETERS, MADISON CLINTON (1859-). An American clergyman, born in Lehigh Co., Pa. He was educated at Franklin and Marshall College, and at Heidelberg Theological Seminary, Tiffin, Ohio, whence he entered the ministry of the Reformed church in 1880. Between this year and 1907, when he gave up a denominational connection to become a "free" preacher, he was pastor of the following churches: First Presbyterian, Philadelphia; Bloomingdale Reformed, New York, Sumner Avenue Baptist, Brooklyn; Immanuel Baptist, Baltimore; and Epiphany (Episcopal), New York. He wrote: *Justice to the Jew* (1899; new ed. rev., 1910); *The Birds of the Bible* (1901); *Will the Coming Man Marry?* (1905); *Abraham Lincoln's Religion* (1909); *Haym Salomon* (1911); *The Mission of Masonry* (1913); *The Genius of the Jew* (1914).

PETERS, NORBERT (1863-). A German Catholic biblical scholar, born at Allendorf. He was educated at the universities of Münster, Bonn, Tübingen, and Würzburg and at the Eichstätt and Paderborn seminaries for priests. Ordained a priest in 1887, in 1892 he became professor of theology at Paderborn, where he was dean in 1898-99, 1904-05, and 1909-10. His name is intimately connected with modern Catholic criticism of the Old Testament, especially the Book of Ecclesiasticus, of which he edited the Hebrew text in 1902 with a German and in 1905 with a Latin version, and of which

he published a German translation with commentary in 1913. Among his other publications are: *Die Prophetie Obadias* (1892); *David's Jugend* (1899); *Beiträge zur Text- und Literaturkritik des Buchs Samuel* (1899); *Bibel und Naturwissenschaft* (1906); *Katholische Kirche und Bibellessen* (1908); *Die Religion des Alten Testaments* (1911); *Der Text des Alten Testaments und seine Geschichte* (1912); *Der Krieg des Herrn* (1914).

PETERS, PHILLIS. See WHEATLEY, PHILLIS.

PETERS, RICHARD (1744-1828). An American jurist, born in Belmont, Pa. (now part of Philadelphia). He graduated at Philadelphia College (now University of Philadelphia) in 1761, studied law, and soon rose to eminence at the bar. During the Revolutionary War he was captain of a militia company in 1775-76, was secretary of the Board of War from 1776 to 1781, and was instrumental in having Benedict Arnold tried before a court-martial in January, 1780. He was a member of Congress in 1782-83, sat in the State Assembly in 1787-91, and was a United States district judge from 1792 to 1828. He was one of the founders of the Philadelphia Agricultural Society and its president for more than 30 years and in 1797 demonstrated by a series of experiments the agricultural value of gypsum. He published *Admiralty Decisions in the United States District Court of Pennsylvania* (2 vols., 1807).—His son, **RICHARD PETERS, JR.** (1780-1848), was successor of Henry Wheaton as reporter of the United States Superior Court and published *Reports of the United States Circuit Court, 1803-18* (1819); *Reports of the United States Supreme Court, 1828-43* (17 vols., 1828-43); *Condensed Reports of Cases in the United States Supreme Court from its Organization till 1827* (6 vols., 1835). He was also editor of *Chitty on Bills*; *Bushrod Washington's Circuit Court Reports, Third Circuit* (4 vols., 1803-27), and of the *United States Statutes at Large*.

PETERS, SAMUEL (1735-1826). An American clergyman, the author of a well-known history of Connecticut. He was born at Hebron, Conn., Dec. 12, 1735, graduated at Yale in 1757, and in 1759 was ordained in London as a minister of the Church of England. Returning to Connecticut in 1760, he was placed in charge of the churches of Hebron and Hartford. In the pre-Revolutionary controversies he embraced the Tory cause and was so pronounced in his loyalty to the crown that in 1774 he was forced by the Sons of Liberty to abandon the Colony and take refuge in England. Here in 1781 he published anonymously his celebrated *General History of Connecticut, from its First Settlement under General Fennycok, Esq., to its Latest Period of Amity with Great Britain* (republished in New York, 1877), in which he gave a code of so-called "blue laws" which attracted widespread attention. These laws were formerly supposed to have been pure forgeries and fabrications, but recent investigations have shown them to have been taken in part from an earlier writer (Neal) and in part (with modifications) from actual laws, only two or three of the 45 apparently having been invented out of hand. More than one-half really existed in New Haven, and more than four-fifths existed in some form in the New England Colonies. The most extreme (and most quoted) of these laws were never in force in Connecticut. In 1794 Peters was chosen Bishop of Vermont, but was never consecrated.

In 1805 Peters came to New York. In 1817 he visited the Falls of St. Anthony, taking up a large claim there, but again settled in New York (1818) and died there in great poverty April 19, 1828. He published a number of books and pamphlets, characterized by a slovenly and uncritical scholarship and by a general uniformity of misstatement and reckless assertion. Consult: Trumbull, *The Rev. Samuel Peters: His Defenders and Apologists* (Hartford, 1877); id., *The True Blue Laws of Connecticut and New Haven* (ib., 1876); "Examination of Peters's Blue Laws," by Prince, in *Annual Report of the American Historical Association* for 1898.

PETERS, WILLIAM JOHN (1863-). An American scientist and Arctic explorer, born at Oakland, Cal., and educated at the University of California. As topographer of the United States Geological Survey (1884-1902) he was engaged in topographic and triangulation work in the United States and in Alaska. From 1903 to 1905 he was chief of the scientific force of the Ziegler polar expedition to Franz Josef Archipelago and as chief magnetic observer and commander of the Carnegie Institution yachts *Galilee* and *Carnegie* he made (1906-14) a magnetic survey of the oceans of the world. He commanded a magnetic expedition to the Hudson Bay region in 1914. His principal published works are discussions of the magnetic, meteorological, and tidal observation in Franz Josef Archipelago (*Ziegler Polar Expedition*, 1907); and, as assistant to and collaborator with Prof. L. A. Bauer, "Magnetic Declinations and Chart Corrections Obtained by the Carnegie" (*Terrestrial Magazine*, vols. xv-xix).

PETERSBURG. An incorporated town, of about 1000 inhabitants, on Mitkof Island, Alaska (Map: Alaska, N 7). It is the centre of a large and lucrative halibut trade and produces much lumber.

PETERSBURG. A city and the county seat of Menard Co., Ill., 21 miles by rail northwest of Springfield, on the Sangamon River and at the junction of the Chicago, Peoria, and St. Louis and the Chicago and Alton railroads (Map: Illinois, E 6). The city contains a Carnegie library, a high school, and a monument to General Stephenson, founder of the G. A. R. It is surrounded by a farming and stock-raising district, having deposits of coal. There are several coal mines and various manufactories, including flour mills, a canning factory, brick and tile plant, etc. The water works are owned by the municipality. Pop., 1900, 2807; 1910, 2587.

PETERSBURG. A town and the county seat of Pike Co., Ind., 40 miles north by east of Evansville, on the Chicago and Eastern Illinois Railroad (Map: Indiana, C 7). Interesting features are the Thornton's Home for Orphan Children and Old Indian Fort, built in 1807. The town has manufactures of flour, brick and tile, lumber, etc., and considerable trade in coal, which is mined extensively in the vicinity. Agriculture and stock raising also are important industries in the fertile region adjacent. Natural gas and oil are found near by. The water works are owned by the municipality. Pop., 1900, 1751; 1910, 2170.

PETERSBURG. A city, independent of county authority, at the junction of Chesterfield, Dinwiddie, and Prince George counties, Va., 23 miles south of Richmond, at the head

of navigation, on the Appomattox River and the upper Appomattox Canal and on the Norfolk and Western, the Atlantic Coast Line, and the Seaboard Air Line railroads (Map: Virginia, G 4). There are two steel bridges across the river and two public parks. Petersburg is the seat of the State Central Hospital for the Insane, with 1000 colored patients, the Virginia Normal and Industrial Institute, for the higher education of colored students of both sexes, and Southern Female College. It has a Benevolent Mechanics Association, with a library and museum. There are also the Young Men's Christian Association, the Home for the Sick, and fine Masonic, Odd Fellows', and Red Men's buildings. Petersburg carries on an extensive trade in tobacco, lumber, and peanuts, and is an important industrial centre, its manufacturing interests being promoted by excellent water power. The value of exports from the port of Petersburg amounted in 1914 to \$4,746,677, while importations were valued at \$813,531. The products of the principal industries are cotton, tobacco, machinery, trunks, clothing, silk and knit goods. The government is vested in a mayor, elected every four years, and a board of aldermen which controls elections of all officials governing the administrative departments. The water works are owned and operated by the municipality. Pop., 1900, 21,810; 1910, 24,127; 1914 (U. S. est.), 25,112.

Petersburg was founded in 1733 on the site of an Appomattox Indian village destroyed in 1676 by Nathaniel Bacon, was incorporated as a town in 1748, and was chartered as a city in 1850. During the Revolution it was twice occupied by the British under General Philips, and in the War of 1812 the Petersburg volunteers served with conspicuous gallantry. Being a great railway centre of supply from the south, Petersburg was the scene of much of the fighting in the Virginia campaign of 1864-65. (See CIVIL WAR IN AMERICA.) After his disastrous failure at Cold Harbor June 3, 1864 (q.v.), Grant marched his army of more than 100,000 men to the James River, with the idea in part of taking Petersburg and thus of forcing the evacuation of Richmond. General Butler, at Bermuda Hundred, was hastily reinforced by a corps under Gen. W. F. Smith, and was ordered to attack Petersburg, then defended by only 2500 Confederates. But, though his force numbered 16,000, he carried out his orders (June 15) half-heartedly and inefficiently and thus allowed Confederate reinforcements to be thrown into the city. Grant, arriving on June 16, made bloody but unsuccessful assaults on the 16th, 17th, and 18th, his losses for the three days being fully 10,000. He then settled down for a siege. On July 30 the famous Petersburg mine—a shaft 520 feet long with lateral branches (near the end) extending 40 feet on each side—was exploded with terrific effect, a Confederate regiment being destroyed and a huge crater produced, through which an inefficiently commanded force of Federals tried to fight its way. The Confederates quickly recovered, poured a deadly artillery fire into the crater, and the Federals were forced back with a loss of more than 4000. Lee repeatedly foiled the manoeuvres of Grant, but finally, on April 2, 1865, after the disaster at Five Forks, was compelled to evacuate both Petersburg and Richmond. Consult Humphrey, *The Virginia Campaign of 1864 and 1865* (New York, 1893).

PETER SCHLEMIHL, pā'tēr shlä'mēl. A widely popular tale by Chamisso (1813), relating the adventures of a man who sells his shadow to the Evil One in return for an inexhaustible magic purse.

PETERSEN, pā'tēr-sen, EUGEN (1836-). A German archaeologist, born at Heiligenhafen in Holstein. He studied at Kiel and Bonn, in 1873 was appointed professor of archaeology at Dorpat and in 1879 at Prague. He was a member of the Austrian archaeological expeditions to Greece in 1880 and to Asia Minor in 1882-85. In 1886, after removing to Berlin, Petersen was sent to Athens as secretary of the German Archaeological School, and from 1887 to 1905 he occupied a corresponding post in the German School at Rome. He edited Theophrastus' *Characters* (1859) and wrote: *Die Kunst des Pheidias am Parthenon und zu Olympia* (1873); *Reisen in Lykien* (1889), with others; *Städte Pamphyliens und Pisidiens* (1890-92), with Niemann and Count Lanckoronski; *Vom alten Rom* (1898; 2d ed., 1900); *Trojans dakische Kriege nach Säulenrelief* (1899 et seq.); *Die Skulpturen des vatikanischen Museums* (vol. i, 1903), with W. Ameling; *Comitum, Rostra, Grab des Romulus* (Rome, 1904); etc.

PETERSEN, JOHANN WILHELM (1649-1727). A Lutheran mystic. He was born at Osnabrück, taught at Rostock and Giessen, when he came under the influence of Spener (q.v.) and the Pietists, and preached acceptably at Hanover. In 1678 he became superintendent of Lübeck. Ten years later he was chosen to a similar position at Lüneburg, but his millenarian views led to his summary removal and banishment in 1692. He went to Magdeburg and spent the rest of his life preparing pamphlets and treatises explaining and defending his views. Petersen was the leading Lutheran mystic and pre-millenarian of the seventeenth century. He was entirely orthodox and conventional except upon a few points, such as the thousand years' reign of Christ upon earth and the apocatastasis, or doctrine of universal restoration. Petersen wrote his autobiography, *Lebensbeschreibung* (2d ed., Frankfurt, 1719). One of his treatises, *Die Stimmen aus Zion*, appeared in Ebenezer, N. Y. (1851-52). Consult his *Life* by Kirschner (Eutin, 1862) and A. Ritschl, *Geschichte des Pietismus* (Bonn, 1884).

PETERSEN, NIELS MATTHIAS (1791-1862). A Danish scholar and historian of literature, born at Sanderum, on Fünen. He was appointed professor in the Normal School of Brahamtölleborg, was employed in the state archives, and in 1845 was chosen professor of Scandinavian languages in the University of Copenhagen. Petersen wrote on mythology, history, geography, and above all on literary history. His most important works are *Bidrag til den old Nordiske Literaturs Historie* (1866) and *Bidrag til den Danske Literaturs Historie* (5 vols., 1853-61; 2d ed., 1867-71), a valuable work which stops with the beginning of the nineteenth century.

PETER SIMPLE. A novel by Captain Marryat (1834). This rollicking sea tale gives the adventures of a midshipman on a man-of-war.

PETERSON, FREDERICK (1859-). An American neurologist and alienist, born at Fari-bault, Minn. In 1879 he was graduated from the medical department of the University of Buffalo. After several years in Europe he be-

came, in 1882, professor of general pathology and director of the laboratory of the University of Buffalo. In 1888 he established himself in New York City as a specialist in nervous and mental troubles. In 1893-94 he was professor of neurology at the University of Vermont. For several years he was professor of neurology in the Women's Medical College (New York) and he served as chief of clinic in the Department of Nervous Diseases, Columbia University until 1903, when he was appointed professor of psychiatry. He was president of the New York State Commission in Lunacy 1900-04. For many years he was an editor of the *American Medico-Surgical Bulletin*. Besides writing numerous monographs he contributed to Church and Peterson's *Nervous and Mental Diseases* (1899; 8th ed., 1914) and wrote *American Textbook of Legal Medicine and Toxicology* (1903). He is also the author of *Poems and Swedish Translations* (1883); *In the Shade of Yggdrasil* (1893); *A Song of the Latter Day* (1904).

PETERSON, SIR WILLIAM (1856-). A Canadian educator and classical scholar, born in Edinburgh, Scotland, and educated at Edinburgh University, Corpus Christi College, Oxford, and Göttingen University, Germany. He was assistant professor of humanity, Edinburgh University (1879-82); principal of University College, Dundee (1882-95); and thereafter principal of McGill University, Montreal. Peterson was elected a vice president of the Archaeological Institute of America and in 1910 became chairman of the board of trustees of the Carnegie Foundation for the Advancement of Teaching. He was made C.M.G. in 1901 and K.C.M.G. in 1915. Peterson edited and annotated: *Quintilian's Institutes of Oratory* (1891); *The Dialogues of Tacitus* (1893); *The Speech of Cicero for Cluentius* (1895); *The Cluni MS. of Cicero* (1901); *Cicero's Verrine Orations* (1907); *Cicero's Post Reditu Orations* (1910). In 1915 he published *Canadian Essays and Addresses*.

PETER'S PENCE. The name given to offerings made for the support of the Pope, called in early English Romefoh or Romescot. As a definite historical tribute it seems to have had its origin in England, from which it spread to Denmark and Norway under Canute. The origin of the payment has been attributed to Ina, King of the West Saxons, and by others to Offa and to Ethelwulf; but the question is still obscure. It was collected annually in the month of July, or between the feasts of Sts Peter and Paul and of St Peter's chains. It consisted in the payment of a silver penny by every family that possessed land or cattle of the yearly value of 30 pence. The payment was finally abolished under Henry VIII, and in other countries it did not survive the Reformation. Latterly the name has been often applied to the voluntary offerings for the support of the holy see made by its subjects in all parts of the world, since the loss of its territorial possessions has made other support necessary. The seventh Provincial Council, Baltimore, 1849, approved the custom for Catholics in the United States. Consult: A. M. von Steinle, *Die Peterspfennig* (Frankfurt, 1893) O. Jensen, in the *Transactions of the Royal Historical Society*, n. s., vols. xv, xix (London 1901, 1906); id., *Die englische Peterspfennig* (Heidelberg, 1903); Leopold von Ranke, *Hu*

tory of the Popes, vol. i (Eng. trans. by Foster, London, 1908).

PETERSEN, pã'ters-sen, (HJALMAR) EILIF (EMANUEL) (1852-). A Norwegian landscape, historical, and genre painter, born in Christiania. He studied at Karlsruhe and in Munich under Lindenschmit, and first painted historical episodes such as "Christian II Signing a Death Warrant" (1876, Breslau Museum); then religious subjects, in which he was influenced by the Venetians, whom he studied in Italy. The best example in this kind is "The Ascension," in Ulleren Church. It was in Italy that he emancipated himself from the old Munich traditions; on returning home in 1883 he became known as one of the greatest Norwegian plein-air painters. His genre scenes and landscapes are sometimes full of dazzling color, as in "Piazza Montanara" (1882) and "The Laundresses" (1889), or delicately harmonious, as in "The Woodland Lake" (1891), "Summer Night" (Munich Pinakothek), "Gajamars Song" (1904-07).

PETER THE CRUEL, King of Castile. See PEDRO THE CRUEL.

PETER THE HERMIT, or PETER OF AMIENS (c.1050-1115). The preacher of the First Crusade. He was born in the city or at least in the diocese of Amiens about 1050. The stories told of his early life, that he was a soldier, married, and had several children, are fictitious. It is believed that he undertook a pilgrimage to the Holy Land but did not reach Jerusalem. Legend told of a visit to Jerusalem and a divine commission in a dream, a story which first appears in William of Tyre. It is doubtful whether he was the originator of the Crusade in any real sense. After the Council of Clermont in 1095 (see CRUSADE; URBAN II) Peter appeared as a preacher of the Crusade in northern and central France. He rode on a mule, with a crucifix in his hand, his head and feet bare; his dress was a long robe and a hermit's cloak of the coarsest stuff, girt with a cord. He preached with the greatest earnestness in the pulpits, on the roads, and in the market places, everywhere arousing his hearers to a high pitch of enthusiasm, and was honored as a saint inspired from heaven. As early as April, 1096, Peter reached Cologne with a following of 15,000 men, and there his army received an accession of 15,000 more. They were mostly from the lower classes, poorly organized, and little fitted for war or the hardships before them. In disorderly bands they made their way through Germany and Hungary towards Constantinople. (See CRUSADE.) Peter himself reached the city in July and accompanied his army across the Bosphorus. But, disgusted by the insubordination of his followers, he returned to Constantinople and gave up the attempt to act as leader. During the siege of Antioch in 1098 he made a cowardly attempt to run away, but nevertheless was soon after that trusted with a difficult commission to Kerbuga, King of Mosul, and acquitted himself with credit. During the winter of 1098-99, when many wished to abandon the Crusade, Peter appeared in his old rôle of preacher, urging its continuance. He tried to defend the poor against the selfishness of the leaders. On July 8, 1099, he preached on the Mount of Olives. After the capture of Jerusalem (July 15, 1099) he remained in the city, while the army proceeded towards Egypt. He returned home, probably shortly after the battle of Asca-

lon, and became monk and prior at Neufmoustier, near Huy, in the diocese of Liège, where he died July 8, 1115.

Bibliography. P. d'Oultreman, *La vie du vénérable Pierre l'Ermitte* (Mons, 1612; reprinted at Clermont, 1895), containing the traditional view; Heinrich Hagemeyer, *Peter der Eremit* (Leipzig, 1879); Franz, *Peter von Amiens* (Hofgeismar, 1891); Donnet, *Pierre l'Hermitte* (Antwerp, 1893); Philip Schaff, *History of the Christian Church*, vol. i (New York, 1899); D. A. Goodsell, *Peter the Hermit* (ib., 1906); *Pierre l'Ermitte's Mighty Friend*, translated by John Hannon (ib., 1912); also general histories of the Crusades.

PETER THE VENERABLE, or PETER OF MONTBOISSIER (c.1092-1156). Abbot of Cluny. He was born at Montboissier, was educated in a Cistercian monastery, took the monastic vows in Cluny (1111), and was chosen prior of the famous monastery there when only 30 years old. He cultivated learning and piety and exemplified both in his own life. He visited England and Spain and was in the Council of Pisa (1134). It is related that he reconciled the kings of Castile and Aragon and that he advocated the claim of Innocent II to the Papal throne and secured his general acceptance by the Church. He also befriended Abélard, and gave him a refuge in the monastery of Cluny for the close of his troubled life. Peter died at Cluny, Dec. 25, 1156. Three of his treatises deserve separate mention: (1) *Against the Jews*; (2) *Two Books of Famous Miracles* (French trans. by d'Avenel, Paris, 1874); (3) *Against the execrable Sect of the Saracens*. In the last-named work he shows considerable knowledge of his subject; he had a condensed Latin translation of the Koran made by his secretary, Peter of Poitiers, which was long the only one extant; it was edited by Bibliander and published at Basel in 1543. Unfortunately only two of the five books of this treatise are extant. He also wrote against the Petrobrusians. (See BRUYS, PIERRE DE.) Peter's letters are important for the history of the period. His writings, with a *Life* by Rodolphus, are collected in Migne, *Patrologia Latina*, clxxxix. Consult: C. A. Wilkens, *Petrus der Ehrwürdige* (Leipzig, 1857); J. d'Avenel, *Vie de Pierre le Vénérable* (Paris, 1874); Demimuid, *Pierre le Vénérable, ou la vie et l'influence monastique au douzième siècle* (new ed., ib., 1895).

PETERWARDEIN, pã'tër-vãr-din' (Hung. *Pétervárad*). A free town and strong fortress in the County of Syrmien, Croatia and Slavonia, Hungary, situated on a promontory on the right bank of the Danube opposite Neusatz, with which town it is connected by two bridges. The fortifications are situated at the base of a high rock and on its summit overlooking the plain. The trade is chiefly in grain, wine, and fruit. Pop., 1900, 5019; 1910, 5727. Peterwardein is believed to occupy the site of the Roman Acumincum. The fortress was captured by the Turks in 1526 and was the scene of the defeat of the Grand Vizier Ali by Prince Eugene of Savoy in 1716, after which it was awarded to the Emperor by the Peace of Passarowitz in 1718.

PETHICK LAWRENCE, FREDERICK WILLIAM and EMMELINE. See LAWRENCE.

PETIGRU, JAMES LOUIS (1789-1863). An American jurist, born in Abbeville District, S. C. He graduated at the College of South

Carolina in 1809 and taught until his admission to the bar in 1812. He began practice in this district, volunteered for the defense of Port Royal against a threatened British attack in 1813, and soon afterward was elected solicitor of the district. In 1819 he accepted an advantageous partnership in Charleston, and was elected Attorney-General of the State in 1822. When the issue of nullification (q.v.) was presented he opposed it with courage under difficult circumstances, became prominent in the Union party, and resigned his office in 1830 to become a candidate for the State Senate. He was defeated, and incurred much unpopularity. From 1850 to 1853 he was United States district attorney, and later was selected to codify the laws of South Carolina, which task was finished in 1862. He vigorously opposed secession, but preserved the respect of his fellow citizens. His bust was placed in the city hall of Charleston in 1883. Consult W. J. Grayson, *James Louis Petigru* (New York, 1866).

PETIOLE (from Lat. *petiolus*, stalk or stem of fruits, irregular dim. of *pes*, foot). The stalklike portion of a leaf (q.v.).

PÉTION, pá'syón', ALEXANDRE SABES (1770-1818). A Haitian general and politician, born at Port-au-Prince, the son of a white father and a mulatto mother. He received a good education and fought for his country's independence under Toussaint L'Ouverture. Later he joined General Rigaud against L'Ouverture, went to France in 1800, and returned in 1802 with General Leclerc. He subsequently served under Dessalines (q.v.) against the French. Upon the death of Dessalines and the succession of Christophe (q.v.) the southern part of the island set up an independent republic and Pétion, who was Governor of Port-au-Prince, was chosen President in 1807. There followed a civil war with Christophe, which desolated the country for many years. Pétion remained at the head of the government in the southern part of the island until his death. While in power Pétion displayed an amount of moderation strange in a Haitian politician. He protected the foreigners in the country and made some attempts to preserve the national credit. A sketch of his military and political career is given in St. John, *Hayti*; or, *The Black Republic* (London, 1884).

PÉTION DE VILLENEUVE, de vél'něv', JÉRÔME (1756-94). A French revolutionist. He was the son of a procurator at Chartres and was practicing as an advocate and writing revolutionary essays in his native city when he was elected in 1789 a deputy to the States-General. He became a prominent member of the Jacobin Club and an ally of Robespierre. He was sent as one of three commissioners to bring back the royal family from Varennes after their attempted flight, and in the execution of this commission he acted in a harsh and unfeeling manner. In November, 1791, he was elected mayor of Paris to replace Bailly. He became a member of the Convention and on Sept. 20, 1792, its first president. He favored the Girondists, and although at the trial of the King he voted for his death, he was suspected of being a Royalist and of complicity in the treason of Dumouriez. He was thrown into prison, June 2, 1793, on the fall of the Gironde, but escaped and joined the other Girondists at Caen. In company with Buzot he reached the neighborhood of Bordeaux. A short time after their dead

bodies were found in a field near Saint-Emilion, and they were supposed to have committed suicide. The public career of Pétion shows him to have been weak, shallow, ostentatious, and vain. The *Œuvres de Pétion*, containing his speeches and some small political treatises, were published at Paris in four volumes (1793). Consult his *Mémoires inédites*, edited by Dauban (Paris, 1866); Vatel, *Charlotte Corday et les Girondins* (ib., 1872); F. A. Aulard, *Les orateurs de la Constituante* (ib., 1882). See FRENCH REVOLUTION.

PETIT, pe-tě', EDOUARD (1858-). A French educator, born at Marseilles. He was educated at the lycée of Marseilles and at the Collège Rollin and became a doctor of letters. Subsequently he taught at the Collège Rollin and at the lycées of Nîmes and Janson-de-Sailly. In 1894 he began the organization of popular education and became Inspector General of Public Instruction. Petit was made a Knight of the Legion of Honor. His writings include: *Francis Garnier* (1885); *Lectures tirées d'auteurs modernes* (1887); *François Mignet* (1889); *Autour de l'école* (1890); *L'Ecole moderne* (1891); *De l'école au régiment* (1895); *L'Ecole de demain* (1902); *Jean Laveur* (1905); *La vie scolaire* (1907); *Autour de l'éducation populaire* (1908); *La commune et la mutualité scolaire* (1909); *Eugène Pelletan: sa vie, son œuvre* (1913); *Histoire illustrée des pays et des peuples* (1913).

PETIT DE JULLEVILLE, pe-tě' de zhul'-vèl', LOUIS (1841-1900). A French scholar and literary critic, born in Paris. From the Ecole Normale (1860-63) he went to the French School in Athens, was made doctor of letters in 1868, and, after teaching rhetoric in the Collège Stanislaus, Paris, removed to Dijon. Thence he returned to Paris, where he became professor of French mediæval literature and of the history of the French language in the Faculty of Letters (1886). Three of his works were crowned by the Academy. Besides textbooks on his subject he published: *Histoire de la Grèce sous la domination romaine* (1875); *Histoire du théâtre en France. Les mystères* (1880); *Les comédiens au moyen âge* (1885); *La comédie et les mœurs en France au moyen âge* (1888); *Le théâtre en France* (1889). He was general editor of a *Histoire de la langue et de la littérature française* (8 vols., 1896-1900). To this work he contributed several valuable articles.

PETIT GRAIN, pét'í grân'; Fr. pron. pe-tě'-grân', OIL OF. See ORANGE OIL.

PETITION (Lat. *petitio*, from *petere*, to seek; connected with Gk. *néreōbai*, *petesthai*, Skt. *pat*, to fly). A supplication preferred to one capable of granting it. The right of a British subject to petition the sovereign or either House of Parliament for redress of grievances is a fundamental principle of the English constitution and has been exercised from very early times. The right was so generally exercised in the time of Edward I and Edward II that it became necessary to formulate rules and methods by which the task of hearing petitions could be facilitated. Those which could not be answered without special reference to the King formed a special branch of business, and it was from the share of the Chancellor in examining and reporting on petitions for clemency and favor that his equitable jurisdiction grew up in the fourteenth century. The nomination of receivers and triers of petitions became a

part of the opening business of every Parliament, and proclamation was made inviting all persons to resort to the receivers. The receivers were clerks or masters in chancery; the triers were selected by the King from the Lords, spiritual and temporal, and from the justices. The triers could call to their assistance the Chancellor, Treasurer, Steward, and Chamberlain. After examining into the nature of the grievances for which redress was sought, they referred the petitions to certain of the courts or to Parliament for further action.

In the time of Richard II the work of receiving and hearing petitions was divided into three parts—one part for the consideration of the King, one for the Council, and one for Parliament. The increasing power of the Commons over taxes and expenditures vastly argued the importance of the right of petition to the crown. In the fourteenth century they began the policy of accompanying their grants with petitions for redress in the name of the whole community. Later the petition for redress preceded the grant, and the latter was made conditional upon the promise of the King to provide the desired relief.

Since the revolution of 1688 the practice has been gradually introduced of petitioning Parliament, not so much for the redress of specific grievances as regarding general questions of public policy. Petitions must be in proper form and respectful in language; and there are cases where petitions to the House of Commons will only be received if recommended by the crown. A petition must, in ordinary cases, be presented by a member of the House to which it is addressed; but petitions from the Corporation of London may be presented by the sheriffs or Lord Mayor. Petitions from the Corporation of Dublin have also been allowed to be presented by the Lord Mayor of that city.

The practice of the House of Lords is to allow a petition to be made the subject of a debate when it is presented; and unless a debate has arisen on it, no public record is kept of its substance or of the parties by whom it is signed. In the House of Commons petitions not relating to matters of urgency are referred to the Committee on Public Petitions, and in certain cases ordered to be printed.

The Constitution of the United States, like that of Great Britain, guarantees to every citizen the right of petition for a redress of grievances.

This constitutional right was practically nullified once in our history by the action of the national House of Representatives in the case of those petitions which related to the abolition of negro slavery. This was the so-called gag resolution of January, 1840, which provided that no antislavery petition should be received or heard by the House of Representatives.

PETITION AND ADVICE, THE HUMBLE. A written constitution of England during the Protectorate. The first Parliament elected according to the Instrument of Government (q.v.) was dissolved because it assumed the function of altering the constitution under which it was called. A second Parliament was summoned by Cromwell, who was in urgent need of money, to meet on Sept. 17, 1656, but nearly 100 of its members had to be excluded as hostile to the Protector's government. After this purge the assembly was ready to carry out Cromwell's wishes, asked him to take the title of King, and

laid before him for approval a Humble Petition and Advice. This may be regarded as practically an amended constitution, although it did not entirely supersede the Instrument of Government. The Protector declined the royal title, but after some alteration the Humble Petition and Advice was passed and received his assent on May 25, 1657. On the 26th of the following month it was somewhat modified by the Additional Petition and Advice, designed mainly to explain certain doubts and questions which had arisen. As a result of the two instruments the powers of the Council of State were lessened and those of the Parliament were increased. Henceforth the latter was to consist of two Houses, and the Protector was not again to exclude from sitting therein those who had been legally elected. As some compensation for this loss of authority he was allowed to appoint his successor and to nominate the life members of "the other House," which was substituted for the House of Lords. The text of the Petition is contained in S. R. Gardiner, *Constitutional Documents of the Puritan Revolution* (Oxford, 1889). Consult also David Masson, *Life of Milton* (London, 1873-94). See CROMWELL, OLIVER.

PETITION OF RIGHTS. A declaration of certain rights and privileges of the subject obtained from King Charles I in his third Parliament (1628). It was so called because the Commons stated their grievances in the form of a petition, refusing to grant the supplies till its prayer was heard. The petition is supposed to be a mere corroboration and explanation of the ancient constitution of the kingdom, and after reciting various statutes, recognizing the rights contended for, prays "that no man be compelled to make or yield any gift, loan, benevolence, tax, or such like charge, without common consent by act of Parliament; that none be called upon to make answer for refusal so to do; that freemen be imprisoned or detained only by the law of the land, or by due process of law, and not by the King's special command, without any charge; that persons be not compelled to receive soldiers and mariners into their houses against the laws and customs of the realm; that commissions for proceeding by martial law be revoked." The King at first eluded the petition, expressing in general terms his wish that right should be done according to the laws and that his subjects should have no reason to complain of wrongs or oppressions; but at this reply the Commons expressed dissatisfaction and prepared a remonstrance against the advisers of the King. The King thereupon ordered them not to meddle with affairs of state. The Commons then took up the charges against Buckingham, when the King yielded to their demands and gave his assent to the petition, June 7, 1628.

PETITIO PRINCIPII, pè-tish'î-ô prin-sîp'î-i (Lat., begging of the question). The name given in logic to that species of vicious reasoning in which the proposition to be proved is assumed in the premises of the syllogism.

PETIT JOURNAL, pe-té' zhôor'nâl', L. A daily paper, founded at Paris in 1863, republican in politics, with an immense circulation throughout the country as well as in Paris.

PETIT MAL, pe-té' mál'. See EPILEPSY.

PETIT MARTINIQUE, pe-té' mâr'tè'nek'. See GRENADINES.

PETITOT, pe-té'tô', JEAN (1607-91). A

painter in enamel, the foremost artist in this branch. (See *MINIATURE PAINTING*.) He was born in Geneva, Switzerland, where he learned the jeweler's trade under Pierre Bordier, and early began to use enamel in connection with his work. He removed with Bordier to France, and afterward to England, where he soon attracted the notice of Charles I. He had apartments in Whitehall and made various portraits of the King and his court. One of the Duchess of Southampton (1642), in the collection of the Duke of Devonshire, is called his masterpiece; another, of the Duchess of Richmond, is in the Morgan collection, New York. After the execution of Charles I Petitot went with the royal family to Paris, where he formed a partnership with Jacques Bordier, a cousin of Pierre, who was largely responsible for the enamels of the portraits designed by Petitot. The latter enjoyed the favor and patronage of Louis XIV; he lived in the Louvre and painted the King, Cardinal Mazarin, the Duchess de la Vallière, and other celebrities of the time. These are included in the collection of his works in the Louvre, but he is seen to best advantage in England in the Jones collection, in South Kensington Museum, in Windsor Castle, and in private collections. He is admirably represented also in the J P Morgan loan collection, Metropolitan Museum, New York. His discoveries of new colors, particularly in the flesh tints and in reds, transformed the art and enabled him to attain delicate and harmonious effects. The Revocation of the Edict of Nantes of 1685 sent him back to Geneva, despite the fact that Louis had Bossuet himself try to convert him. In Geneva the aged artist was constantly employed by John Sobieski, King of Poland, and other distinguished patrons, until his death at Vevey. Consult G. C. Williamson, *History of Portrait Miniatures* (London, 1904), and Ernest Stroehlin, *Petitot et Bordier* (Geneva, 1905).

His son and pupil, JEAN LOUIS PETITOT (1652-c 1730), divided his time between Paris and London, where he was frequently employed by Charles II. Although his work resembles his father's to such an extent that it is frequently confounded with it, and is often masterly, it lacks the latter's purity of color. His portraits of Charles II, Peter the Great, and others are in the South Kensington Museum, London, and he is excellently represented in the Morgan collection (Metropolitan Museum, New York) and in the Earl of Dartrey's and other private collections in England.

PETIT-QUEVILLY, pe-té'-ke-vé'yé. A town of France in the Department of Seine-Inférieure, situated on the left bank of the Seine 2 miles southwest of Rouen. Its principal industries are cotton and linen spinning and the manufacture of shoes, chemicals, starch, soap, and machinery. Pop., 1901, 13,948; 1911, 16,682.

PETIT-THOUARS, ABEL AUBERT and LOUIS MARIE AUBERT, DU. See DUPETIT-THOUARS.

PETO, SIR SAMUEL MORTON (1809-89). An English contractor and legislator, born in Woking, Surrey. He was apprenticed to his uncle, a builder, at whose death in 1830 he and his cousin, Thomas Grissell, inherited the business and established the firm of Grissell and Peto. They secured a number of important contracts, among them those for the Conservative and other clubhouses, several London theatres, the Nelson Column, the Houses of Parliament, and a large part of the Great Western and the

Southeastern railroads. In 1846 they dissolved their partnership, Grissell taking the building and Peto the railroad contracts. The same year Peto took Edward L. Betts into partnership with him, and the new firm secured contracts for railroads in England, France, Norway, Denmark, Russia, Canada, and Australia. During the Crimean War Peto constructed a railroad between Balaclava and the intrenchments, which proved of great service and for which he was created Baronet in 1855. He served several terms in Parliament, but in 1868 was obliged to resign because of the failure of his firm during the financial panic of 1866. Consult *Sir Morton Peto: A Memorial Sketch* (London, 1893).

PETŐFI, pé'té-fi, SÁNDOR (ALEXANDER) (1822-49). The national poet of Hungary, born at Kiskőrös in the County of Pest, Dec. 31, 1822. His father was a butcher and a small landowner in Little Cumania (a country celebrated by Petőfi in his poem *Kis Kunsg*) and bore the name of Petrovics, a name indicating Serb origin. His Slovak mother only learned Hungarian after her marriage. In 1838 his father was impoverished by an overflow of the Danube, which destroyed his little estate; and it was only by the help of kinsmen that he was able to rear his son for a profession. Petőfi was sent to the lyceum of the town of Schemnitz (Selmecz). He ran away with a band of German strollers, and again from school at Oedenburg, this time enlisting as a common soldier (1839). After two years in the army a physician brought about his discharge and he went home. He afterward went to Pápa to complete his education. In 1842 he left Pápa to join a troop of comedians, but he soon parted from them. He made his way to Pressburg and afterward to Pest, where he got some employment as a translator. Going to Debreczin, he made another venture as an actor, playing the part of Othello, but again failed and spent the winter of 1843-44 ill, starving, and freezing. He did not lose courage, however, and started for Pest. On his arrival at that city he exchanged the name of Petrovics for Petőfi, and it was not long before he became famous as a lyric poet.

Petőfi introduced himself to Vörösmarty, then the poet of Hungary, who received the shabby stranger coldly, but when he had listened to his verses he exclaimed, "Hungary never had such lyrics; you must be cared for"; and from that time he treated Petőfi as a son. Petőfi was almost at once received into the Literary National Circle, at the expense of which was published his *Versek* (Verses), which appeared in 1844. This was rapidly followed by other volumes, which won boundless popularity. In September, 1847, he married his beloved "Juliska" Szendrey. In March, 1848, he was the leader in the first movement of the Hungarian revolution at Pest, and he became, by speech and pen, the advocate of the independence of Hungary. His poem, *Talpra, Magyar!* (Up, Magyar!), like later stirring lyrics, excited great patriotic enthusiasm. He enlisted in the national army, and in the beginning of 1849 he was appointed adjutant and secretary to General Bem. Petőfi was at the battle of Schässburg (Segesvár), fought on July 31, 1849, in which Bem's army was overwhelmed. He was never heard of after that day. It is believed that he was killed by a Cossack in the fight and that his body, so mangled as to escape recognition, was buried with the multi-

tude of Magyar dead left upon the field. His countrymen at first believed that he was not dead but a prisoner in an Austrian dungeon. In 1877 a rumor gained currency that Petöfi was still living as a Russian prisoner in one of the mines of Siberia, and the Austrian government was forced by public opinion to institute official inquiries in order to prove the groundlessness of the report. On Oct. 15, 1882, a monument to the poet was unveiled in Petöfi Square at Budapest, and the house in which he was born at Kiskőrös was purchased with the intent to preserve it. He left a widow and one son.

Petöfi is the greatest literary genius of Hungary and he ranks, by common critical consent, among the greatest lyric poets of the last century. An enthusiastic devotee of nature, country, and liberty, strongly attached to his mother, friends, and love, Petöfi expressed his affections in figures of unsurpassed concreteness. His unmistakable sincerity, a healthy optimism tempered by a melancholy resignation, his good-natured humor, and strong personality, all contributed to make him the most popular Hungarian poet. The most beautiful of his poems are his impassioned shorter lyrics, of which he published several collections, under the titles *Cypress Leaves on Etelka's Grave*; *Pearls of Love*; *Starless Nights*; *Clouds*. The most celebrated of his narrative poems are the humorous *János, the Hero and Istók, the Fool*. His earliest work was *The Wine-Drinkers*, published in 1842; his latest, *The Assessor of the Judgment-Seat*, which appeared in 1849. Petöfi translated Shakespeare's *Coriolanus* in 1848. A volume, containing a poem entitled *The Apostle*, was suppressed by the Austrian government after the pacification of Hungary. Petöfi published a novel, *The Hangman's Rope* (1847), which failed, like his play *Tiger and Hyena*, and he wrote several volumes of tales, criticisms, and sketches of travel; he also translated largely from English, German, and French into Magyar.

Among the numerous more or less complete German translations of Petöfi's poems may be mentioned those of Kertbeny (1858), Neugebauer (latest ed., 1909), Steinbach (1902), and Schnitzer (6 vols., Leipzig, 1910). His prose works are available in German in Reclam's Universal Bibliothek. His poems have also been translated, in part, into French (by Desbordes-Valmore and Ujfalvi, 1872, and others), Flemish, Polish, Danish, and Italian; and an English version, comprising his finest poems, was published in London in 1866 by Sir John Bowring. A number of *Selections*, translated by Phillips, appeared at Philadelphia (1885), and a volume of *Gems from Petöfi*, translated by W. Loew, at New York (1881; enlarged as *Poetry Selections from Hungarian Poets*, ib., 1899). An édition de luxe of Petöfi's complete works was published in 1874 (Pest), and a critical edition by A. Haras in 1892-96 (6 vols., ib.). Consult: A. Bubenik, *Petöfi: eine Skizze seines Lebens und Dichtens* (Vienna, 1882); Fischer, *Petöfi's Leben und Werke* (Leipzig, 1889); and the biographies in Magyar by Zilahy (Budapest, 1864), A. Vutkovics (Pressburg, 1883), Gyulai (Budapest, 1884), Ferenczi (ib., 1896). The publication of a periodical devoted to the poet, *Petöfi Museum*, was begun in 1888.

PETOSKEY, pē-tōs'kē. A city and the county seat of Emmet Co., Mich., 191 miles north by east of Grand Rapids, on Little Traverse

Bay, an arm of Lake Michigan, and on the Grand Rapids and Indiana and the Pere Marquette railroads (Map: Michigan, E 3). Steamers ply several of the important lake ports. Petoskey is an attractive summer resort and has a Carnegie library, a county normal school, two hospitals, and a beautiful system of parks. There are ironworks, foundry and machine shops, limekilns, block and flooring factory, lumber and flour mills, a leather factory, rotary-pump factory, launch and rowboat factory, rug and carpet factory, etc. Petoskey became a city in 1896. The water works and electric-light plant are owned by the municipality. Pop., 1900, 5285; 1910, 4778.

PETRA (Gk. *πέτρα*, rock). An ancient city in northern Arabia, about 70 miles northeast of Akabah. It occupied a narrow rocky valley overhung by mountains, the highest and best known being Jebel Harun, or Mount Hor, directly to the west. Petra owes its Greek name to its peculiar character as a rock city. It is possibly a translation of Zur, which the Greek version with its *πέτρα* suggests as the original text rather than Gur in 2 Chron. xxvi. 7. Jerome identified it with Sela', which also means rock, in 2 Kings xiv. 7, Isa. xvi. 1, a place captured by Amaziah of Judah and called Joktheel. But Petra is thought by some scholars to be too far south for Sela, and both Musil and Dalman identify Sela' with the modern Chirbet Sil', or a neighboring site, farther north, within what may be regarded with certainty as Edomitic territory. The question, however, must be left open. According to Josephus (*Ant.*, iv, 7, 1) the native name of Petra was Rekem, and there can be no doubt about this. He also declares that it was named after Rekem, the Midianitish King mentioned with Zur and others in Num. xxxi. 8, and that the tomb of Aaron was in the neighborhood. (*Ant.*, iv, 4, 7.) The Targums wrongly identify Rekem with Kadesh Barnea (q.v.), probably confusing two places around which traditions of Moses and Aaron clustered. If Zur refers to Petra in 2 Chron. xxvi. 7, Uziah (c.777-737) fought with the Arabians who dwelt there; and if Sela' refers to Petra in 2 Kings xiv. 7, Amaziah (796-777) conquered it. The traditions concerning Jebel Harun as the site of the tomb of Aaron and the stream of Ayun Musa flowing through the Sik as the waters Moses brought from the cleft rock, which cannot well have developed in Nabatean times, speak in favor of an early Jewish occupancy of the place. But our real knowledge of Petra begins in 311 B.C., when Athenæus surprised the city in the night and held it for a few hours, only to leave the following morning and to suffer a crushing defeat at the hands of 8000 Nabateans. In the same year Antigonos sent Demetrius to take the city; he besieged it in vain and agreed to march off in return for a present of 700 camels. The tombs of the third century B.C. still show the genuinely Nabatean style. In the second century Hellenic influence began to be strongly felt. Petra remained the capital of a Nabatean kingdom, whose rulers have left numerous inscriptions and whose history is otherwise known through Greek writers (see **NABATEANS**), until it was conquered by Cornelius Palma in 106 A.D. and made the capital of the Roman Province of Arabia. Hadrian visited the city in 129 A.D. and increased its privileges. There is no evidence of Christianity having been introduced before Constantine. (Cf.

Harnack, *Die Mission und Ausbreitung des Christentums*, Leipzig, 1902, p. 447.) According to Sozomen (*Ecc. Hist.*, vii, 15) the inhabitants of Petra strongly opposed Christianity about 400 A.D., and Epiphanius describes their Dusares cult. But in the fifth century Petra became the seat of a metropolitan, and Arabia Petraea under the new name Palæstina Tertia was assigned to the patriarchate of Jerusalem. As trade began to follow other channels the importance of Petra declined. It was conquered by the Moslems in the seventh century, and gradually fell into ruins. The signs of occupation by the Crusaders are slight. The very site was unknown to Europeans for centuries, until it was discovered by Burckhardt in 1812. Since then the remarkable remains of Petra have been seen and examined by many travelers. The most careful study of them has been made in recent years by Brünnow and Domaszewski, Musil, and Dalman. They stand in a small open irregular basin about $\frac{1}{2}$ mile square, through which runs a perennial stream of purest water, and are best approached by an extraordinary chasm or ravine called the Sik, or Wadi Musa, narrowing as it proceeds till in some places the width is only 12 feet, while the rocky walls of red sandstone tower to a height of from 100 to 200 feet. This gorge was once the highway to Petra, and the remains of an ancient pavement can be traced beneath the brilliant oleanders that now line the stream. All along the face of the rocky walls are rows of cave tombs, hewn out of the solid stone and ornamented with façades. These are also numerous elsewhere in and about the city. Brünnow and Domaszewski examined over 800 of these tombs in the necropolis of Petra. Among the most important ruins the following deserve special mention. The most beautiful of all the temple tombs is Herabet el jerra (the ruin of the urn), or Haznet Fir'un (the treasury of Pharaoh). It directly faces the gorge of Wadi Musa. On the façade Isis is represented with her symbols, the horned solar disk and the ears of corn, six Amazons, two of the Eumenides, the Dioscures, eagles, a panther, a lion, and other figures. Domaszewski regards it as an Isis temple built at the suggestion of Hadrian; Dalman accepts the judgment of De Luynes and Studniczka that it belongs to the Hellenistic period, and considers it as a tomb temple, possibly erected by a prince like Aretas III Philhellen (83-60 B.C.). The amphitheatre, capable of seating some 5000 spectators, is comparatively well preserved. The Deir, or Convent, is a huge monolithic temple or temple tomb hewn out of the side of a cliff and facing Mount Hor. Kasr Fir'un (Pharaoh's palace) is the best-preserved ruin of Petra, east of which are the remains of a triumphal arch. A most interesting sanctuary on Zibb 'atuf, discovered by Edward L. Wilson in 1882, was at first thought to be a very ancient high place, but Savignac and Dalman assign this well-preserved open-air temple without wall, but with court, altar, mensa sacra, and throne of the god (probably Dusares), to the first century B.C. On the tomb of Aaron, which is not inaccessible, as has been so often asserted, but was visited by Schmidt in 1905, see AARON. Three distinct periods of architecture have been discerned at Petra—the early Nabataean, down to the beginning of the second century B.C.; the Hellenistic, to 106 A.D.; and the Roman, from that time to the destruction of the city. Over

80 Nabataean inscriptions, a dozen in Greek, and a few in Latin and in Arabic have been found at Petra. Some of them are dated. The ruins of the city, which at one time may have had a population of from 40,000 to 50,000, bear most eloquent testimony to its power, wealth, and culture.

Bibliography. Laborde and Linant, *Voyage dans l'Arabie Pétrée* (Paris, 1830); Visconti, *Diario di un viaggio in Arabia Petrea* (Rome, 1872); De Luynes, *Voyage aux bords de la Mer Morte, à Petra, et sur la rive gauche du Jourdain* (Paris, 1874); Brünnow and Domaszewski, *Die Provincia Arabia* (Strassburg, 1904-07); Libbey and Hoskins, *The Jordan Valley and Petra* (New York, 1905); Alois Musil, *Arabia Petraea*, vol. ii (Vienna, 1907-08); G. H. Dalman, *Petra und seine Felsenheiligtümer* (Leipzig, 1908); id., *Neue Petra Forschungen und der heilige Felsen von Jerusalem* (ib., 1912); Benzinger, in Baedeker, *Palestine and Syria* (5th ed., ib., 1912).

PETRALITE. See EXPLOSIVES.

PETRARCH (It. **PETRARCA**, pâ-trär'ka), FRANCESCO (1304-74). An Italian poet and humanist, born at Arezzo, July 20, 1304, of a family then in exile from Florence because of its affiliation with the party of the Bianchi. To the family name Petrarco the young Francesco gave the more pleasing form Petrarca. The wanderings of the family took the lad to Pisto in 1310 and in 1313 to Avignon in France. After preliminary training he was sent to Montpellier in 1319 to study law. Some four years later he went unwillingly to Bologna to continue his studies in jurisprudence, for he shrank from pettifoggery, though he admired the majesty of Roman law. A love of the classics, particularly of Cicero, early took possession of him. To them he devoted himself after the death of his father (1326), who had once flung his son's books of poetry and rhetoric into the flames, allowing the half-burnt manuscripts to be rescued, however, at Francesco's passionate entreaty. His father having left him no means to continue his studies, he returned to Avignon and took minor orders as an ecclesiastic, thus providing for himself a livelihood which insured to him the freedom which he so jealously guarded. He entered into the gay and fashionable life of Avignon, at that time the seat of the papacy and the animated meeting place of Italian and French culture. There in 1327 he met that Laura who was to inspire his imperishable lyrics. We cannot yet be certain of her identity, but it is probable that she was Laura de Noves, wife of Hughes de Sade and mother of 11 children at the time of her death by the plague of 1348. Her relations with Petrarch during these 21 years seem to have been as innocent as they were beautiful.

But his love for Laura was only another cause for restlessness. Animated by that interest in the external world that is characteristic of the Renaissance, he traveled through Belgium, Switzerland, France, Spain, and even Hungary, constantly questioning, seeking for direct information. In this he is as modern as when he looks within himself and describes his impressions and his emotions. In 1337 for the first time he entered Rome. That same year an unknown woman bore Petrarch a son, Giovanni, and probably it was she who gave him a daughter Francesca in 1343. These children were legitimized by papal bulls. At intervals he went back again

to Avignon, and thence he withdrew for a while to the solitude of Vaucluse, (Valchiusa). It was here that he received in 1340 from the universities of Paris and Rome invitations to visit those places and receive the crown of the poet laureate. He decided in favor of the University of Rome, and on Easter Sunday, 1341, he was publicly crowned on the Capitol. He visited many Italian cities and in 1343 was sent by Pope Clement VI on an embassy from Avignon to Naples. Constantly on the alert for manuscripts, he had the good fortune to discover some of the letters of Cicero, just as he had earlier brought to light two of Cicero's orations. He may also have found a part of the *Institutiones* of Quintilian. At Parma he received tidings in 1348 of Laura. The news of her death and of that of his friend Cardinal Colonna affected him greatly and was the inspiration of new songs. In 1350 he was in Florence with Boccaccio and in 1351 Boccaccio visited him at Padua. Having refused several offers of apostolic secretariats from the holy see, he left Avignon for good in 1353. About this time began his connection with the Visconti in Milan, who in 1356 sent him to Prague as Ambassador to Charles IV of Germany, and in 1360 he undertook a similar mission to Paris. The remaining years of his life were mainly spent in scholarly pursuits at Arqua, near Padua, and there, July 18, 1374, he died, after a life which in spite of its inconsistencies, his advocacy of civic independence, and his praise of the tyrant Galeazzo, his desire for office and his unwillingness to accept it for fear of losing his freedom to come and go, his love of quiet and his constant travel, his vows of celibacy and his proclaimed paternity, had had more than the usual measure of success and some moments of glory.

His Latin works, on which he prided himself—the *Africa*, in hexameters, dealing with the undertakings of Scipio Africanus, moral, historical, and other scientific treatises, letters, the *Carmen Bucolicum* and the *Epistole Metricæ*, which contain many allusions to events of his time and life, as do also his *Lettere*—have not the elegance of Poliziano or Bembo nor the polished brilliance of Erasmus; yet his zeal for the correction of manuscripts and the accumulation of learning and his passionate love of living antiquity were among the powerful influences in the Renaissance and mark an epoch in the development of modern scholarship. But it was the *Canzoniere*, most of them sonnets to the golden-haired Laura, living and dead, some of them to his friends, which brought Petrarch even in his lifetime that fame which he believed his writings would win for him. The canzone to Italy breathes a passion of patriotism not heard again in the lyric until Leopardi. The songs to those scenes in which he has lived show not so much keen observation as appreciation of the beauties of nature which are the setting of his emotion—another link with the nineteenth century. The forms of verse he took from the earlier love poets, and occasionally fell into some of their mannerisms. It was these trivialities caught up by later versifiers which were developed into the Petrarchism for a while rampant in France and Spain as well as in Italy. It must be admitted also that Petrarch's instability of mood—his belief one moment that his love for Laura is a good, which will bring him glory and salvation, and that of the next that it is an evil bringing him suffering in this

world and damnation in the next—gives the basis for the antitheses carried to such extremes by the Petrarchists. Petrarch is not all modern. Besides the traces of troubadour workmanship in his verse there is mediæval mysticism in his thought. For the most part a sensuous pagan rejoicing in the beauty of his world, he is often the ascetic and fearful Christian. Perhaps his greatest service was the formulating of the æsthetics of his age. With the ideal of style constantly before him he labored at his Latin writings. With the ideal of beauty he gave to some of his sonnets a classic plasticity, and in his constant observation of his inner state, he discovered that each moment brings with it the possibility of a lyric.

Bibliography. The edition of Petrarch's Latin and Italian works published at Basel in 1554 forms the basis for all later editions. Consult also a critical edition of the *Africa* by Corradini (Padua, 1874, with an Italian translation by Gaudio, Oneglia, 1874); also one by Agostino Palesa (Milan, 1904); the *Poemata Minora* (Milan, 1829-34); the editions of the *Canzoniere* by Mestica (Florence, 1895) and by Carducci and Ferrari (ib., 1899); the editions by Fracassetti (ib., 1859-63) of the *Epistole de Rebus Familiaribus et Variæ*, published in Italian as the *Lettere di Francesco Petrarca (familiari e varie) volgarizzate e dichiarate* (ib., 1863-67); and *Lettere senili*, etc. (ib., 1869-70); *The Triumphs of Francesco Petrarca, Florentine Poet Laureate*, translated by Henry Boyd, with introduction by Guido Biagi (Cambridge, Mass., 1906); A. Marsand, *Biblioteca petrarchesca* (Milan, 1826); G. J. Ferrazzi, "Bibliografia petrarchesca," in his *Manuale dantesco* (Bassano, 1865-77); Hortis, *Catalogo delle opere di Francesco Petrarca*, etc. (Triest, 1874); Gustav Körting, *Petrarcas Leben und Werke* (Leipzig, 1878); Henry Reeve, *Petrarch* (Philadelphia, 1878); D. W. Fiske, *A Catalogue of Petrarch Books* (Ithaca, N. Y., 1882); Voigt, "Die Briefsammlungen Petrarkas," in the *Abhandlungen der historischen Classe der bayerischen Akademie der Wissenschaften*, vol. xiii (Munich, 1883); D. W. Fiske, *A Hand-List of Petrarch Editions in the Florentine Public Libraries* (Florence, 1886); D'Ovidio, "Madonna Laura," in the *Nuova Antologia* (Rome, 1888); A. J. F. Mézières, *Pétrarque: Etude d'après de nouveaux documents* (new ed., Paris, 1895); Carlo Segre, "Chaucer e Petrarca," in *Nuova Antologia* (Rome, 1899); E. J. Mills, *Secret of Petrarch* (New York, 1904); Pietro Borghesi, *Petrarch and his Influence on English Literature* (Bologna, 1906); H. C. Hollway-Calthrop, *Petrarch: His Life and Times* (New York, 1907); Pierre de Nolhac, *Petrarch and the Ancient World* (Boston, 1907); id., *Pétrarque et l'Humanisme* (new ed., 2 vols., Paris, 1907); M. F. Jerrold, *Francesco Petrarca, Poet and Humanist* (New York, 1909); Kenneth McKenzie (comp.), *Concordanza delle rime di Francesco Petrarca* (Boston, 1913); *Petrarch, the First Modern Scholar and Man of Letters: A Selection from his Correspondence*, Translated from the original Latin by Robinson and Rolfe (2d ed., New York, 1914); *Some Love Songs of Petrarch, Translated and Annotated, and with a Biographical Introduction* by W. D. Foulke (London, 1915); D. W. Fiske, *Petrarch Bibliography* (Ithaca, 1915).

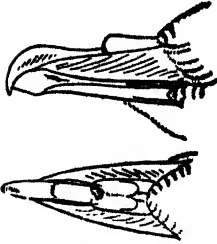
PETREL (Fr. *pétrel*, from ML. **Petrellus*, dim. of Lat. *Petrus*, Peter; so called in allusion



PETRARCH

FROM AN ENGRAVING BY RAFFAELLO MORGHEN AFTER A PAINTING BY TOFANELLI

to its walking on the sea, like the Apostle Peter). A sea bird of the family Procellariidae, containing several genera and distinguished by having the bill hooked at the tip, and hard, and the nostrils united into a tube along the culmen, and the hind toe merely rudimentary. Petrels have very long and pointed wings and the tail square or slightly forked. They possess great power of wing and are among the most strictly oceanic of birds. Among the 70 species of the Procellariidae are reckoned the fulmars and shearwaters (q.v.), besides the many petrels proper, of which the stormy petrel is an example. They run along the surface of the waves in a remarkable manner and with great rapidity



TYPE OF PETREL BILL.

Side and top views of bill of pintado petrel (*Daption capensis*), showing the tubular nostrils.

sea is stormy and the mollusks and other animals that form their food come in abundance to the surface. From the frequency with which flocks of these birds are seen in windy weather, or as heralds of a storm, they are superstitiously regarded by sailors. They are to be seen in the seas of all parts of the world, but are more abundant in the Southern than in the Northern Hemisphere.

The names stormy petrel and Mother Carey's chicken are sometimes more particularly given to *Procellaria*, or *Thalassidroma pelagica*, a bird scarcely larger than a lark, 5½ inches long, and the smallest web-footed bird known. It is sooty black in color, with a little white on the wings and near the tail. Two other species of petrel are of frequent occurrence in the North Atlantic, Leach's petrel (*Oceanodroma leucorhoa*) and the better-known Wilson's petrel (*Oceanites oceanicus*). The former may be recognized by its larger size (8 inches long) and its forked tail. It breeds among the islands in the Bay of Fundy, and in similar places in the North Pacific. The Wilson's petrel, on the other hand, is a bird of the Antarctic regions, and migrates during its winter (our summer) into the Northern Hemisphere. It is easily distinguished by its small size (7 inches long), the yellow on the webs of the feet, and the white upper tail coverts. Besides these three species, no less than a dozen others have been recorded from the coasts or inland waters of the United States. Of these one is a common Pacific coast species, two others are known only from the coast of southern California, while the remaining nine are stragglers from the Southern Hemisphere. The cape pigeon (*Daption capensis*), or pintado, is a very large species, well known to voyagers about the Cape of Good Hope; and in the Indian Ocean and about the shores of Australia occurs the giant of the family, the huge bone breaker (*Ossifraga gigantea*), which sailors call stinkpot, and other names referring to its vile odor. Petrels generally breed in holes and clefts of rock or on secluded coasts, and are likely to visit their nests (except when the female is sitting) only at night. Only a single egg is laid, as a rule, which is white, or sprinkled with a few fine reddish dots. See COLORED PLATE OF EGGS OF AMERICAN WATER AND GAME BIRDS.

Consult: S. F. Baird, *Water Birds of North America* (Boston, 1884); A. H. Evans, *Birds* (London, 1901); Godman, *A Monograph of the Petrels* (ib., 1913).

PETRI, pã'trë, OLAVUS (1493-1552). A Swedish reformer, born at Orebro in Nerike. He studied at Upsala and the University of Leipzig, and afterward at Wittenberg, where he continued his theological studies under Luther and Melancthon. Upon the recommendation of King Gustavus I he was appointed town clerk of Stockholm (1524) and at the same time preached in the cathedral, where he fearlessly expounded and urgently pleaded for the introduction of the reformed religious service. Petri was the first to introduce the Reformation into Sweden. In 1526 he translated the New Testament into Swedish and later, with his brother, the Old Testament. He wrote the first hymn book in Swedish, also a Swedish chronicle (to 1520). This was published in the *Scriptores Rerum Suecicarum Medii* (1818). From 1531 to 1533 he was chancellor of the King, but his enthusiasm got him into trouble with his sovereign and at one time seemed likely to cost him his life.

His brother, LAURENTIUS (c.1499-1573), first Lutheran Archbishop of Sweden, was born at Orebro. About 1527 he was appointed professor of theology at Upsala, and in 1531 he was elected first Lutheran Archbishop. He drew up the first Swedish Evangelical church order that was printed (1571) and wrote many theological treatises defending the principles of Church reform.

PETRIE, pe'tri, (WILLIAM MATTHEW) FLINDERS (1853-). An English Egyptologist, born at Charlton, June 3, 1853, the son of William Petrie and Anne, daughter of Capt. Matthew Flinders, the Australian explorer. He was educated at private schools and at first turned his attention to the study of British archaeology. His earliest works were *Inductive Metrology* (1875) and *Stonehenge: Plans, Descriptions, and Theories* (1880). From 1880 to 1914 he occupied himself with the investigation of Egyptian antiquities and made many valuable discoveries. Between 1884 and 1886 he excavated the site of Tanis, Naukratis, and Daphne and revealed the existence of ancient Greek settlements at the two latter places. From 1888 to 1890 he worked in the Fayum, finding a number of interesting funeral portraits at Hawara and gathering an extensive collection of valuable papyri, chiefly from the ruins of Kahun and Gurob. In 1890, working under the Palestine Exploration Fund (q.v.), he was engaged in the excavations of the site of ancient Lachish at Tell el Hesay. (See also BLISS, FREDERICK JONES.) In 1892 he was appointed Edwards professor of Egyptology in University College, London. See GLASS for his views on the early manufacture of this substance. At Nagada he discovered in 1895 the remains of a prehistoric race, and the following year found at Thebes the stele of Meneptah, containing the sole mention of Israel occurring in the Egyptian inscriptions. After 1899 he investigated the very interesting tombs of the first dynasty at Abydos. In general, for accounts of his explorations, consult the publications of the Egyptian Exploration Fund. Petrie received honorary degrees from Oxford and other universities. Among his more important works may be mentioned: *The Pyramids and Temples of Gizeh* (1883); *Tanis I and II* (1885-87); *Hawara* (1889); *Kahun* (1890); *Ten Years' Dig-*

gings (1893); *A History of Egypt* (1894; new ed., 5 vols., 1905); *Tell el-Amarna* (1894); *Egyptian Tales* (1895-99); *Religion and Conscience in Ancient Egypt* (1898); *Royal Tombs of the First Dynasty* (1900-01); *Methods and Aims of Archaeology* (1904); *Religion of Ancient Egypt* (1906); *Personal Religion in Egypt* (1908); *Arts and Crafts in Egypt* (1909); *The Growth of the Gospel* (1910); *Historical Studies* (1910); *Revolutions of Civilization* (1911); *The Formation of the Alphabet* (1912); *Tarkhan I* (1913); *Tarkhan II* (1914).

PETRIFICATION (from Lat. *petra*, from Gk. *πέτρα*, rock + *facere*, to make). A name given to organic remains found in the strata of the earth, because they are generally more or less mineralized or made into stone. The word has fallen into disuse, having given place to the term "fossil" (q.v.).

PETRIFIED FOREST. See NATIONAL MONUMENTS.

PETRIFIED FORESTS. The same as fossil forests (q.v.).

PETRIFIED WOOD. Plant remains in which the woody tissue has been replaced by mineral matter, usually some form of silica. The name "dendrolites" has been given to petrified fragments of plants that are commonly found in the coal measures. See FOSSIL FORESTS.

PETROBRUSIANS. See BRUYS, PIERRE DE.

PETROGRAD, *pyētrō-grāt*. The official name of the capital of the Russian Empire. The name St. Petersburg was abandoned during the European War which broke out in 1914 because of its Teutonic origin. See SAINT PETERSBURG.

PETROGRAPHIC PROVINCE (from Gk. *πέτρα*, *petra*, rock + *γράφειν*, *graphein*, to write). A region within which the igneous rocks reveal a relationship (so-called consanguinity) in chemical composition, which may be referred to a community of origin. This relationship may be chemically a close one, but the rocks have widely varying mineralogical composition, or the kinship may be restricted to one or more of the chemical components in the rocks.

PETROGRAPHY. See PETROLOGY

PETROLATUM (Neo-Lat., from ML. *petroleum*, rock oil, from Lat. *petra*, from Gk. *πέτρα*, rock + *oleum*, from Gk. *ἐλαίον*, *elaion*, oil). A residue from the distillation of petroleum, prepared by filtration, and known to the trade by different names, as petroleum jelly, vaseline, and cosmoline. Petrolatum is a white or amber-colored, translucent, semisolid substance, slightly soluble in alcohol and readily so in ether. It does not become rancid, and is largely used in pharmaceutical preparations, especially ointments, instead of the ordinary fats. Taken internally, it is a remedy for coughs and colds. It is an excellent lubricant and will protect polished steel from rust. The term "vaseline," while often applied to petrolatum in general, is really a trade name, protected by copyright, belonging to one particular preparation. See PETROLEUM.

PETROLEUM (ML., rock oil). A natural rock oil composed chiefly of hydrocarbons. It is classed with natural gas and asphalt as a bitumen, natural gas containing the more volatile members of the series, asphalt the solid, while petroleum is composed chiefly of the liquid members, although it contains a small proportion of both solid and gaseous compounds.

History. Petroleum has long been known in

various parts of the world by its appearance in the form of bituminous springs or as a floating scum on the surface of pools. It was used at a very early period in the walls of Babylon and Nineveh, and Herodotus has described the occurrence of oil springs in the island of Zacynthus, now Zante. In Roman times petroleum was obtained from Sicily and burned in lamps. The first mention of petroleum in America (about 1635) is in a letter written by the Franciscan missionary Joseph de la Roche d'Allion, who refers therein to springs found in the region of what is now southwestern New York or northwestern Pennsylvania. The early settlers of Pennsylvania obtained small quantities of oil by digging wells and scooping out the liquid which seeped in from the surrounding rocks. The drilling of brine wells on the western slopes of the Alleghenies in the early part of the nineteenth century led to the discovery of petroleum at greater depths. A well sunk near Burkesville, Ky., in 1829, yielded great quantities of oil, which flowed to the surface and was drained into the Cumberland River, where at one time it was set on fire. The most important application of petroleum in the early days was in medicine; it was utilized as an illuminant only to a small extent, owing to its offensive odor. In the year 1853 Dr. Brewer suggested the use of petroleum for lubricating and illumination purposes and set to work devising means for purifying the crude product. The Pennsylvania Rock Oil Company was organized in 1854 to drill for oil; although its first well yielded from 400 to 1000 gallons a day, the company was not successful in its business ventures. Five years later, however, Col. E. L. Drake put down a productive well on land leased from this company, and the successful outcome of this undertaking may be said to mark the beginning of the oil industry in the United States. The news of the discovery was followed by a rush of adventurers from all parts of the country, so that by 1860 more than 100 square miles of territory in the vicinity of Oil Creek had been shown to be productive. Much of the oil which reached the surface was allowed to escape, owing to the lack of storage and transportation facilities. As the explorations were extended new fields were opened along the Allegheny River in Pennsylvania, also in Ohio and West Virginia. The Lima field in Ohio and Indiana was first developed in 1885, while the California fields have become large producers only in the last few years. The discovery made in the Beaumont region of Texas early in 1901, which has been followed by extraordinary development, and the discovery of wells of enormous yield in Mexico represent important events in the recent history of petroleum.

Among foreign countries Russia is the largest producer of oil and the strongest competitor of the United States in supplying the world's markets. Operations have been conducted in this country since 1873. The largest fields are located on the Apsheron Peninsula, Baku being the chief centre of the industry. The distillation of petroleum from shales was first undertaken in France in 1834 and was successfully introduced into Scotland in 1850. The importation of shale oil into America led to the use of canal coal for distilling; this industry gained considerable importance in the United States previous to 1860, but quickly succumbed when the first wells became productive.

PETROLEUM



1. OIL WELLS AT LOS ANGELES, CALIFORNIA
2. OIL WELLS ON THE BEACH AT SUMMERLAND, CALIFORNIA

Origin and Geological Occurrence. The geological histories of petroleum and natural gas are closely connected, so that what is said of one practically holds true of the other. Petroleum is, with few exceptions, always found in sedimentary rocks. For many years it was known only in sandstones or shales, and the term "oil sand" was applied to the rock that held it. Subsequently oil was struck in limestone in Ohio, thus forming a new type of occurrence, although one which has since proved to be unique.

Petroleum is considered by most geologists to be of organic origin, as shown by its persistent occurrence in sedimentary rocks, but whether it has been derived from animals or plants, and, if the latter, whether marine or land forms, is still open to dispute. Moreover, the exact details of the process by which organic matter has been converted into oil and gas are somewhat obscure. As opposed to the organic theory is the inorganic one, which assumes that the oil and gas may be hydrocarbons, formed at great depths by the action of steam on metallic carbides—a process that can be demonstrated experimentally, but which is not borne out by field evidence. Another inorganic theory, having many adherents but assented to by few geologists, is that the hydrocarbons of oil and gas are volcanic exhalations.

Petroleum occurs in all geological formations from the Lower Silurian or Ordovician up to the Tertiary; it is chiefly of importance in the Silurian, Devonian, and Tertiary rocks. In these formations the oil may at one place or another be found in sandstone, limestone, or shale, and exceptionally in metamorphic rocks, but in the latter case it has clearly migrated from adjacent sedimentary ones.

In former years great stress was laid on the association of oil with anticlinal or arch folds, capped by previous beds, it being pointed out that where it occurred with gas and water the three tended to arrange themselves according to their specific gravities—gas at the crest, then oil, then water. Subsequent studies have demonstrated quite clearly that sufficiently free movement for such gravitative arrangement does

that this rock should be porous. The degree of porosity not only influences the quantity of oil which the rock can hold, but it may also influence the rate of flow of the well. Some wells may yield as little as 15 barrels per day; others may reach a production of 50,000 or 60,000 barrels per day, or in extreme cases over 100,000 barrels. The porosity of the oil-bearing formation may also change from place to place and would account for the location of a profitable well at one point and a barren one a short distance from it. In order to prevent the escape of oil from the containing stratum it should also be overlain by a rock of more or less impervious nature. (In many wells the petroleum flows to the surface under pressure. Professor Orton believed that the oil was under hydrostatic pressure; according to his theory the pressure in different wells of the same basin or pool ought to be nearly constant. In any region, however, the pressure usually diminishes with time. While Orton's theory may be true for Ohio, it seems doubtful whether hydrostatic pressure will account for the great oil and gas pressure found in some regions. The quantity of oil which a given territory can yield is often very great, since some sand will hold as much as one-eighth of its bulk in oil under pressure. In clean sands the porosity may be 30 per cent, but even though the pores be filled with oil, it may not all be recoverable. If a sand contained 20 per cent voids, filled with oil, then each 100 cubic feet of sand would contain 20 cubic feet of oil, and a bed 100 feet thick covering an acre would contain 155,535 barrels. The amount of recoverable oil, however, may be only 50 per cent of the saturation. The depth at which oil is found is variable, ranging from 400 or 500 feet in some regions to as much as 4000 feet in others.

Character and Composition. Petroleum is a liquid of varying color, being black, brown, red, amber, or straw, and by reflected light often appearing greenish in tint. The black oils in the United States are obtained from the Trenton limestone of Ohio, from California, etc.; the Pennsylvania oils are often of amber tint. Petroleum commonly vary in specific gravity

THE CHEMICAL COMPOSITION OF PETROLEUM

LOCALITY	C	H	O	Specific gravity H ₂ O = 1
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	
Heavy oil, West Virginia	83.5	13.3	3.2	.873
Light oil, West Virginia	84.3	14.1	1.6	.8412
Heavy oil, Pennsylvania	84.9	13.7	1.04	.886
Light oil, Pennsylvania	82.0	14.8	3.2	.816
Parma, Italy	84.0	13.4	1.8	.786
Hanover, Germany	80.4	12.7	6.9	.892
Galicia, Austria	82.2	12.1	5.7	.870
Light oil, Baku, Russia	86.3	13.6	0.1	.884
Heavy oil, Baku, Russia	86.6	12.3	1.1	.938
Java	87.1	12.0	0.9	.923
Beaumont, Texas	86.8	13.2	..	.920

not exist in a porous rock, and that the arrangement and movement of these substances are probably affected by their difference in surface tension and its relation to the pore sizes as well as by hydrostatic motion. Most oil occurrences show a relation to some structure resembling an inverted basin, but some petroleum deposits are found in joint planes, with volcanic necks or with salt domes, or rarely in synclines. The rock in which the oil is found is spoken of as the reservoir or oil sand, and it is essential

between about 0.8 and 0.98, as compared with water. The gravity of an oil is most commonly expressed in degrees of the Beaumé scale, on which water has a gravity of 10 degrees. The temperature at which crude petroleum may solidify ranges from 82° F. in some Burma oils to several degrees below zero in some Italian oils. The flashing point, or the lowest temperature at which inflammable vapors are given off, may be as low as zero degrees in the Italian oils to as high as 370° F. in an oil found on

the Gulf coast of Africa, but these are extreme limits. There is a similar great range in the boiling point, which is 180° F. in some Pennsylvania oils and 338° F. in oils found at Hanover, Germany.

A number of different hydrocarbons have been found in petroleum. Those of the paraffin series are important, as are also the olefines. The acetylene series is represented in some, while the benzene series occur in nearly all, but not in large amounts. Most petroleum contains some nitrogen, but it rarely exceeds 2 per cent, except in some California oils, where it may reach 10 or 20 per cent. Sulphur is rarely absent, but the quantity is usually quite small.

Asphaltic oils are those which on evaporation leave a residue consisting essentially of asphalt, while paraffin oils are those which contain chiefly hydrocarbons of the paraffin or aliphatic series, and which usually yield crystallized paraffin scales when the heavier distillates are cooled to about zero degrees Centigrade. However, the terms "asphaltic" and "paraffin base" are no longer much used.

Distribution of Petroleum. The oldest and most noted field in the United States is the Appalachian, which extends along the western slope of the Appalachian Mountains from southwestern New York (and eastern Ohio) through western Pennsylvania into West Virginia, Kentucky, and Tennessee. The oil-bearing sandstones are partly Devonian and partly Carboniferous, the latter being especially important in West Virginia. On the western border in Ohio oil is found as deep as the Silurian, and in Kentucky even in the Ordovician.

The Lima-Indiana field extends from Lima southwestwardly into Indiana, lying without the Appalachian region, as usually defined. The oil here is carried by the Trenton limestone of the Ordovician, the depth being about 1300 feet; it was first discovered near Findlay, Ohio. The oil is dark and resembles the Tennessee and Canada oils in its sulphur contents. This field is rapidly declining. In recent years Illinois has rapidly sprung into prominence as a producer, the oil coming mainly from the Carboniferous formations of the southeastern part of the State.

Oil has been found at a number of localities in the Tertiary rocks of eastern Texas and western Louisiana. Many of these oils are heavy and asphaltic and are associated with local structural domes, that sometimes contain rock salt. Somewhat lighter oils are present in the Cretaceous of northern Texas and northwestern Louisiana. The first well put down in the Beaumont field of Texas yielded 75,000 barrels of oil a day, spouting the liquid in a 6-inch column to a height of 160 feet. Another field of great prominence extends from southeastern Kansas to east-central Oklahoma, the oil lying in the Cherokee shales and sandstones of the Carboniferous. In Wyoming petroleum occurs in formations ranging from the Upper Carboniferous to the Tertiary, but mostly in those of Mesozoic age. The Cretaceous sandstone at Florence, Colo., yields a heavy oil which resembles that of Wyoming in being valuable as a lubricant. California contains several oil fields and is now the leading State in point of output. The rocks are of Cretaceous to Neocene age. The oil has usually an asphaltic base and is chiefly valuable as a fuel. The largest production comes from Kern County. Petroleum

is also known to occur in Washington, Arizona, New Mexico, Montana, and Utah. A moderate amount of oil is obtained from Lambton Co., Ontario, at a depth of 400 to 500 feet, while petroleum is known to occur in Newfoundland and New Brunswick. There are numerous showings of petroleum on the eastern flank of the Canadian Rocky Mountains up to the Arctic Ocean. Cuba is known to have at least small supplies of oil, and a limited quantity has been exported from Porto Rico. In Mexico active exploration has been carried on at several points in the Gulf coast region with the result of finding large supplies of good oil around Tampico. It has an asphalt base. Of the South American countries, Peru is the most important petroleum producer, most of the output coming from the Zorritos field. Petroleum is also said to occur in Venezuela, Argentina, and Ecuador, but it is not taken out of the ground to any extent.

Russia is the most important foreign producer of petroleum, the fields in the Baku region of southeastern Russia supplying enormous quantities annually. It is a large exporter to other countries. The greater part of the output comes from the Baku field proper, although important quantities are obtained from the Grosni field, 500 miles north of Baku. Rumania contains several promising oil fields, which occur in the same formations as the Russian fields. In Germany oil is obtained near Hanover and also in Alsace, while some is supplied by the Carboniferous rocks of Great Britain, but does not begin to supply the local demand. In Japan petroleum is obtained on the northwestern coast, and some of it is refined. The crude material sometimes yields 60 per cent of illuminating and lubricating oils. A high paraffin oil is found in Java, and Sumatra, Borneo, and the Burma field of India are important producers. While petroleum is known to occur in the Philippines, little is obtained, and that by primitive methods; the islands of Panay, Leyte, Guimaras, Negros, Bohol, Mindanao, and Cebu all carry some petroleum.

Mining and Transportation of Petroleum. The modern method of drilling for petroleum is similar to that used in sinking gas and artesian wells. See DRILL; WELL SINKING. Drill holes are usually cased, or lined with steel piping, for the purpose of keeping out water and preventing the hole from caving in.

Many holes are generally driven into the same oil pool. In some cases closely adjoining holes may have no effect on each other in respect to the flow of oil. In others the oil sands seem to be so porous that oil will easily flow from the bottom of one hole to another close by and thereby decrease the yield of the former. In many cases the oil does not flow when the oil-bearing rock is struck, and it is customary in this instance to explode a torpedo at the bottom of the drill hole, whereupon the oil almost immediately begins to pour out of the well, sometimes with tremendous velocity. In 1913 there were 19,101 oil wells in the United States.

The question of cheap and rapid transportation of crude petroleum from the wells to the refineries is one of great importance. At first the oil was transported on carts, later it was carried in barges or by railway in tank cars, but these methods gave place to the system of pipe lines. At the present day the total length of pipe lines transporting Pennsylvania crude oil is probably over 25,000 miles. The pipes, which

have a diameter of from 4 to 8 inches, are usually laid underground and have bends at regular intervals to allow for contraction and expansion. Stations with pumps and storage tanks are placed from 28 to 30 miles apart, the oil being received into the tank at one pumping station and then forced through the pipe to the next one. Since all petroleum contains more or less paraffin or wax, much trouble is often experienced in the clogging of the pipes, especially in cold weather, and to clear them out an instrument known as the "go-devil" is sent through the pipe. This is so constructed that it is forced along by the moving current of oil and scrapes the paraffin off from the inside of the tube. Pipe lines have been built from the Appalachian oil region to Jersey City, Philadelphia, Baltimore, Chicago, and Cleveland; from Kansas eastward; from Oklahoma to the Gulf of Mexico; and from the California fields to the Pacific coast.

Refining. The refining of petroleum is based upon the separation of the component hydrocarbons by a process of fractional distillation. This is usually carried out in horizontal cylindrical iron stills, which are surmounted by a dome that connects with a vapor pipe. A common size of still is 30 feet long by 12½ feet in diameter, with a capacity of from 650 to 700 barrels of crude oil. When the latter is placed in the still and subjected to increasing temperature, the oils pass off in the order of their volatility; the separation is not absolutely perfect, however, as oils of lower boiling point may carry over some higher ones. As the vapor rises it passes to the condenser, a series of iron pipes surrounded by cold water. The distillates are led off into their respective tanks. This process of distillation, which is known as the intermittent system, is the one commonly followed in the United States, and the still requires periodic refilling. In Russia a continuous system is employed, involving a series of stills, which are heated to successively higher temperatures. The crude oil then flows slowly from one to the other, and from each one there passes off the product volatilizing at the temperature to which the still is heated.

The process of fractional distillation can be divided into two parts. In the first part of the process the more volatile products, such as gasoline and burning oil, are evolved. The residue is then transferred to another still in which the second part of the operation is carried on, the oil being heated to a still higher temperature under partial vacuum or by superheated steam for the purpose of separating lubricating oils and heavier products. The condensing apparatus ends in the tail house, where the distillates are conducted to their proper tanks. When the various fractions of the distillation are to be kept separate and of constant composition, a special form of condenser may be used, by means of which the oil is brought into contact with the surface of iron turnings, thereby increasing the evaporation. If the oil contains sulphur it is necessary to redistill it in stills containing finely divided copper, which removes the sulphur. *Cracking* is a term used to denote the process of condensing the heavier vapors in the still, causing them to become superheated and decomposed, and thus obtaining a more complete separation of the fractions as well as increasing the percentage of illuminating oil. By using the side-fired still and running back all

heavy distillate the products are reduced to three fractions—paraffin, gas, and light-oil distillates. In the distillation of the oil the lightest constituents pass off first and the heaviest last. The fractions obtained in the order of their lightness are the following: *Cymogene*. This is the lightest of all, boiling point 32° F., 110° B., used in ice manufacture. *Rhigolene*. Boiling point, 65° F., 90° B.–100° B., used as an anæsthetic. *Petroleum ether*. A highly volatile product, 80° B.–85° B. It has sometimes been called Sherwood oil. *Gasoline*. This, properly speaking, is the fraction following petroleum ether, although the name is often applied to a mixture of this and the three previous ones, its gravity thus ranging from 80° B. to 62° B. In gasoline proper the boiling point ranges from 90° F. to 200° F. *Naphtha* is a name broadly applied to all light distillates, but more especially to those boiling at 80° F. to 120° F., and whose gravity varies from as low as 62° B. up to 76° B. *Benzine* (q.v.) represents the least volatile product of the naphthas and has a gravity of 82° B.–89° B., and a boiling point of 110° F. to 140° F. *Ligroine* forms a special grade of solvent naphtha, 88° B.–62° B., and a boiling point of 194° F. to 248° F. Following the lighter naphthas come the illuminating oils, divided into heavy and extra-heavy naphthas; in the process of distillation these may either be carried off separately or together. In the former case the heavy naphthas may be redistilled and separated into benzine and light distillate. The latter may then be mixed with the extra-heavy naphthas in varying proportions to form white oil or export oil. There are many grades of domestic illuminating oil or kerosene, which differ chiefly in fire test.

After the naphthas have passed off the residuum is forced through steam-jacketed filters filled with bone black or fuller's earth; the first portions of the filtrate represent light oils and are followed by successively heavier ones. When the petroleum belongs to the paraffin group, the residuum is sometimes placed in the tar still for further distillation, and there the heavy vapors are carried over by the aid of superheated steam, the presence of the latter also preventing dissociation of the oil, which if it occurred would be followed by a lowering of viscosity of the lubricating oil and a decrease in the amount of paraffin obtained. The distillates containing the paraffin are freed from the latter by chilling, the effect of this being to cause a separation of the waxy paraffin scales. The oils thus freed from the paraffin are important lubricants, and under this class a number of grades are known as *spindle oil*, *engine oil*, *summer dark oil*, *winter dark oil*, *cylinder oil*, *valve oil*, etc. The residue now left in the tar still is a porous mass of separated carbon, a solid decomposition product termed coke. The tar is sometimes used without further distillation for the manufacture of vaseline.

Many of the distillates obtained in the treatment of crude petroleum contain acid constituents as well as compounds which in time impart a dark color and unpleasant odor to the distillate. Raw distillates, when used for illuminating purposes, also rapidly char the wick and lose their power of being drawn upward by capillarity. It is therefore customary to purify the various fractions obtained by treatment with sulphuric acid and caustic soda, be-

fore they are marketable. The distillate, which has been first cooled to 60° F., is agitated with sulphuric acid in tall cylindrical tanks of wrought iron lined with sheet lead and known as agitators; about 1½ to 2 per cent of acid is required. The acid is then washed out with water, and a 1 per cent solution of caustic soda added, after which a second agitation takes place, followed by washing and treatment with fuller's earth, which removes much color and odor.

The residuum of Lima oil blown with air at temperatures below distillation yields asphaltic products, used in mixtures with the genuine asphalt. California oils yield a similar product by distillation.

The percentage of the various fractions yielded by different oils varies. Many Pennsylvania oils yield 8 to 10 per cent naphtha, 70 to 80 per cent refined oils, 5 to 9 per cent residuum and 5 per cent loss. In the distillation of 100 gallons of crude petroleum there are obtained, on the average, about 76 gallons of illuminating oil, 11 gallons of gasoline, benzine, and naphtha, and 3 gallons of lubricating oil, while the residuum and loss amount to 10 gallons.

Testing of Refined Oils. Refined oils are usually tested for their color, gravity, flashing and burning points, and sometimes for their behavior when cooled (cold test). The color is determinable by inspection. The gravity is a measure of the purity of the distillate. Too large a proportion of the lighter oils renders the product unsafe for illuminating purposes, while too great a percentage of the heavier oils interferes with its free-burning qualities. (For a description of the *flash test*, see OIL, *Lubricating Oils*.) The gravity test is commonly made by placing the oil in a tall jar and inserting a hydrometer marked preferably with the Baumé scale (water has a value of 10 on this scale). The temperature of oil when this test is made should be 60° F. The fire test includes the determination of the *flashing point*, i.e., the temperature to which the oil must be heated in order to produce a momentary explosion of the mixture of inflammable vapor, and of the *burning point*, i.e., the temperature to which the oil must be heated in contact with the air to take fire and burn on the surface. The burning point is commonly from 8° C. to 20° C. higher than the flashing point. Kerosene for lighting purposes should have a flashing point of not less than 110° F. and a burning point of not less than 125° F. Both the flashing point and the burning point are carefully regulated by law in most civilized countries so as to run the minimum risk from explosion. The cold test is of importance for lubricating oils and is made in order to determine the temperature at which the oil thickens or becomes cloudy. It can be made by cooling the oil in a small tube and noting the temperature at which the oil ceases to flow when the tube is inclined.

Uses. The two chief uses of the distillates from crude petroleum are for illumination and lubrication, but the various fractions in many cases have special applications. Rhigolene is used as a local anæsthetic; petroleum ether is employed as a solvent for caoutchouc, fatty oils, and plant principles, and for carbureting air in gas machines; gasoline is employed in the extraction of oil from oil seeds, in carbureting coal gas, in gasoline lamps, stoves, and internal-combustion engines. Naphthas in general are

employed as solvents for resins in varnish making and in the manufacture of oilcloth. Boulevard gas fluid is a product of 0.68 specific gravity, used in street lamps, while benzoline is a deodorized naphtha of 0.70 specific gravity. Benzine is employed for dry cleaning, as a substitute for and adulterant of turpentine for cleaning printer's type, and for dyers' and painters' use. The benzine of the *United States Pharmacopœia* has a specific gravity of 0.67-0.77 and a boiling point of 122°-144° and therefore represents a higher distillate. Astral oil and mineral sperm oil are special illuminating oils of high flashing points. Crude petroleum is much used for fuel purposes in engines. Along the Pacific coast, especially in southern California, where good coal is scarce, the locomotives consume large quantities of crude oil. Paraffin residue is placed on the market for medicinal purposes under the name of vaseline, petroleum ointment, and cosmoline. It is also used in the manufacture of chewing gum and for insulating purposes in electric work.

Production. The growth of the petroleum industry in the United States is shown in the following table, which gives the annual production at intervals from 1859 to 1910:

YEAR	Barrels
1859	2,000
1860	500,000
1865	2,497,700
1870	5,260,745
1875	10,926,045
1880	26,286,123
1885	21,558,785
1890	45,823,572
1895	52,892,276
1900	63,620,529
1905	134,717,580
1910	209,557,248
1913	248,446,230

The production of crude petroleum in the United States in 1913 amounted to 248,446,230 barrels, valued at \$237,121,388. The number of gallons of petroleum and its derivatives exported in 1914 was 2,281,611,035, valued at \$152,174,056. This went to all parts of the world, but chiefly to Europe. The greater part of the exports consists of illuminating oils. New York is the leading port of exportation, with Philadelphia second. So large has the export trade become that some countries have a large fleet of specially constructed tank steamers engaged in the oil-carrying trade. The world's production of petroleum in 1913 is shown by the following table, from which it will be observed that the United States produced 65.12 per cent of the total for that year and Russia 15.97 per cent.

	Barrels
United States	248,446,230
Russia	60,935,482
Mexico	25,606,291
Rumania	13,554,768
Dutch East Indies	11,966,857
Galicia	7,818,130
India	7,500,000
Japan	1,942,009
Peru	1,857,355
Germany	995,764
Canada	228,080
Italy	50,334
Others	517,616
Total	381,508,916

See ASPHALT; GAS, NATURAL; SHALE OIL.

Bibliography. General: Edward Orton, "Petroleum and Natural Gas in New York," in *New York State Museum, Bulletin*, vol. vi (Albany, 1899); Neuberger and Noalhat, *Tech-*

nology of Petroleum (New York, 1901); W. W. Thornton, *Law Relating to Oil and Gas* (Cincinnati, 1904); Engler and Hofer, *Das Erdöl, seine Physik, Chemie, Geologie, Technologie, und sein Wirtschaftsbetrieb*, vols. i-iii (Leipzig, 1909-13); A. B. Thompson, *Petroleum Mining and Oil-Field Development* (New York, 1910); Heinrich Ries, *Economic Geology* (3d ed., ib., 1910); Hans Hofer, *Das Erdöl und seine Verwandten* (3d ed., Brunswick, 1912); United States Bureau of Mines, *Technical Papers*, Nos. 25, 45, 57, 66, 72 (Washington, 1912-14); Paine and Stroud, *Oil Production Methods* (San Francisco, 1913); Sir Boverton Redwood, *Petroleum and its Products* (3d ed., 3 vols., Philadelphia, 1913); Leon Wenger, *Le pétrole: production, industrie, commerce* (Paris, 1913), containing a bibliography; F. H. Cunningham-Craig, *Oil-Finding: An Introduction to the Geological Study of Petroleum* (London, 1914); Dorsey Hager, *Practical Oil Geology* (New York, 1915); Tinkler and Challenger, *Chemistry of Petroleum and its Substitutes* (ib., 1915); David Holde, *Examination of Hydrocarbon Oils and of Saponifiable Fats and Waxes* (trans. from 4th Ger. ed. by Edward Mueller, ib., 1915); F. A. Talbot, *Oil Conquest of the World* (Philadelphia, 1915). As fuel: Tower and Roberts, *Petroleum the Motive Power of the Future* (New York, 1912); V. B. Lewes, *Oil Fuel* (London, 1913); Albert Sommer, *Petroleum as a Source of Power on Ships* (ib., 1913); Edward Butler, *Oil Fuel: Its Supply, Composition, and Application* (3d ed., Philadelphia, 1914); R. T. Strohm, *Oil Fuel for Steam Boilers* (New York, 1914); also publications of the American Institute of Mining Engineers (New York), Canadian Mining Institute (Ottawa), United States Geological Survey (Washington), and State Geological Surveys.

Foreign: Vaughan, "Bitumen in Cuba," *Engineering and Mining Journal*, vol. lxxiii (New York, 1902); A. P. Bennett, "Report on the Petroleum Industry in Roumania," in *Great Britain, Diplomatic and Consular Reports, Miscellaneous Series*, No. 411 (London, 1896); Tanasescu, "Petroleum in Roumania," *Journal of the Iron and Steel Institute*, part i (ib., 1901); Béla Szilasi, *Die rumänische Petroleum-Industrie* (Vienna, 1913); Spurr, "Mineral Resources of Turkey, part ii, Oil and Gas," in *Engineering and Mining Journal*, vol. lxxiv (New York, 1902); J. D. Henry, *Oil Fields of New Zealand* (London, 1911); E. H. Pascoe, *The Oil Fields of Burma* (Calcutta, 1912). For Russian petroleum: *United States Geological Survey, Mineral Resources, 1900* (Washington, 1901); also J. D. Henry, *Baku: An Eventful History* (London, 1905). A. R. Thompson, *Oil Fields of Russia* (2d ed., London, 1908). For information regarding foreign occurrences and industry, consult also the volumes on *Mineral Resources*, published annually by the United States Geological Survey, and *The Mineral Industry* (New York), published annually by the *Engineering and Mining Journal*. See CONSERVATION.

PETROLEUM JELLY. See PETROLATUM.

PETROLIA. A town of Lambton Co., Ontario, Canada, situated on a branch of the Grand Trunk and on the Michigan Central Railroad, 22 miles east by south of Port Huron (Map: Ontario, C 8). It has a business college, hospital, and two parks, is the centre of production of crude petroleum for southwest

Ontario, and in the vicinity are a large number of oil wells, with an annual output of from 15,000 to 20,000 barrels. There are two large oil refineries and manufactories of oil-well supplies, boilers, machine-shop products, wagons, automobiles, fire extinguishers, bricks and tiles, and nitroglycerine. Pop., 1901, 4315; 1911, 3518.

PETROLOGY (from Gk. *πέτρα*, *petra*, rock + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say), **PETROGRAPHY**, **LITHOLOGY** (obsolescent). The science which treats of the materials of the stony portion of the earth (the lithosphere) and of meteoritic bodies. Petrography is the purely descriptive division of the science, but in general usage it has the same scope as petrology. Petrology, or petrography, is one of the geological sciences, among which it occupies a position similar to that of mineralogy. It concerns itself chiefly with the composition (chemical and mineralogical), textures, origin, and alterations of the rocks, and its methods are chiefly those of chemistry, mineralogy, and physical optics. It is one of the newest of the sciences and may be said to have had its birth in 1862, when Sorby and Zirkel succeeded in preparing transparent rock sections and adapting the microscope to their study. By the use of the petrographic microscope, which is equipped with Nicol prisms for producing polarized light and with other means for testing their optical properties, the various minerals present in a rock section may be identified quite readily, and much may be learned regarding the conditions under which the particular rock was formed. Petrology also inquires into the chemical nature of rocks and the processes by which they may have been modified after they were once formed. In short, it makes use of all available methods for establishing the origin, relationships, and properties of the various rocks and especially with the view to their systematic classification. Some of its larger and more interesting problems are concerned with the investigation of the group of igneous rocks, which are extremely diversified and which constitute by far the greater part of the solid crust of the earth. The classification of this group after a practical plan is a work attended with great difficulty that has not yet been satisfactorily accomplished, at least no system has yet found universal acceptance. A review of the various systems that have been proposed has been made by Cross for the volume upon the *Quantitative Classification of the Igneous Rocks*, which is included in the bibliography below. For information as to the different rock classes, see IGNEOUS ROCKS, SEDIMENTARY ROCKS, METAMORPHIC ROCKS; and for a description of the individual types, see GRANITE, SYENITE, BASALT, SANDSTONE, LIMESTONE, ETC.

Bibliography. Ferdinand Zirkel, *Lehrbuch der Petrographie* (2d ed., 3 vols., Leipzig, 1894); J. J. Teall, *British Petrography* (London, 1898); Cross and others, *Quantitative Classification of the Igneous Rocks* (Chicago, 1903); K. H. F. Rosenbusch, *Mikroskopische Petrographie der Mineralien und Gesteine* (4th ed., 4 vols., Stuttgart, 1904-08; Eng. trans. of 1st ed., by J. P. Iddings, under title of *Microscopical Physiography of the Rock-Making Minerals*, 4th rev. ed., New York, 1898); L. V. Pirsson, *Rocks and Rock Minerals* (ib., 1908); Alfred Harker, *Natural History of Igneous Rocks* (ib., 1909); J. P. Iddings, *Igneous Rocks* (2 vols., ib., 1909-

13); K. H. F. Rosenbusch, *Elemente der Gesteinslehre* (3d ed., Stuttgart, 1910); E. H. Hatch, *Text-Book of Petrology* (6th ed., New York, 1910); J. F. Kemp, *Handbook of Rocks* (5th ed., ib., 1911); F. P. Mennell, *Manual of Petrology* (London, 1913); G. I. Finlay, *Introduction to the Study of Igneous Rocks* (New York, 1913); R. A. Daly, *Igneous Rocks and their Origin* (ib., 1914); Albert Johannsen, *Manual of Petrographic Methods* (ib., 1914).

PETRONIUS, GAIUS. A Roman voluptuary at the court of Nero, whose profligacy is said to have been of the most elaborate description. We know very little about him, but the well-known passage in Tacitus (*Ann.*, xv, 17) is generally supposed to refer to him. This Petronius, at one time proconsul of Bithynia, was subsequently appointed consul, and is said to have performed his official duties with energy and ability. He was later intrusted by his Imperial master and companion with the charge of the royal entertainments and thus obtained the title of *Arbiter Elegantiarum*. The influence which he thus acquired was the cause of his ruin. Tigellinus, another favorite of Nero, conceived a hatred of Petronius, brought false accusations against him, and succeeded in getting his whole household arrested. Petronius, seeing that his destruction was inevitable, committed suicide, 66 A.D., in a languid and graceful style, opening his veins, but every now and then bandaging them to stop the flow of blood, so that he was for a while enabled to chat with his friends and even to appear in the streets of Cumæ before he died. We are told that he wrote, sealed, and dispatched to Nero, a few hours before his death, a paper containing an account of the tyrant's crimes and flagitious deeds. Petronius is generally believed to have been the author of a very remarkable ancient romance, or satire, which has survived in part under the name of *Petroni Arbitri Satiricon*, a notable work of fiction, of which fragments and a long episode entitled *The Dinner of Trimalchio* (*Cena Trimalchionis*) were discovered at different times and published together. As a description of low life in the first century of the Christian era the work is unique, especially to students of archaeology, while to Latinists and Roman philologists it offers the only continuous example of the colloquial (i.e., plebeian) language of the time. The exaggerated picture of the vulgar society of the *nouveaux-riche* is very amusing. The scene is probably laid in Puteoli. The book is memorable as being the first picaresque novel in European literature, and the characters are drawn with great skill, while the language of the narrative is full of exquisite Latinity. It has been falsely styled Menippean, because verse is introduced in it; but this verse is, at least professedly, quoted and not a part of the text. (See **SATIRE**.) The standard text is that of Bücheler (Berlin, 1862), with a smaller edition (Berlin, 1895; last reprint, 1912). There is an edition of the *Cena* episode alone, with German translation and commentary, by Freidländer (Leipzig, 1891; rev. ed., 1906), and an edition with English introduction and commentary by Waters (Boston, 1902). All the fragments were translated into English by Kelly (London, 1856) and there are later translations of the *Cena*, with introductions, by H. T. Peck, containing a bibliography (New York, 1898; last rev., 1908), by M. D. Lowe (Cambridge, 1906), by M. J.

Ryan (London, 1905), and by Michael Heseltine (ib., 1913). For the vocabulary of Petronius, consult: Segebadé and Lommatzsch, *Lexicon Petronianum* (Leipzig, 1898); J. W. Downer, *Metaphors and Word-Plays in Petronius* (Waco, Texas, 1913); also Albert Collignon, *Etude sur Pétrone* (Paris, 1892); id., *Pétrone en France* (id., 1905); F. T. Baldwin, *The Bellum Civile of Petronius* (New York, 1911); Charles Whibley, *Studies in Frankness* (ib., 1912); Emile Thomas, *Pétrone* (3d ed., Paris, 1913); Martin Schanz, *Geschichte der römischen Literatur*, vol. ii, part ii (3d ed., Munich, 1913). In Sienkiewicz's popular novel, *Quo Vadis*, Petronius is a leading character (1895).

PETROPAVLOVSK, pyë'trô-páv'lôfsk. A district town in the Territory of Akmolinsk, west Siberia, situated on the right bank of the Ishim and the Trans-Siberian Railway, 191 miles west by rail from Omsk (Map: Asia, H 3). It was founded in 1752. Tallow and leather are the chief products; there is a considerable trade in animals, animal products and manufactures, with the native tribes. Pop., 43,000, of which about 15,000 are Mohammedans.

PETROPAVLOVSK. The chief town of Kamchatka (q.v.).

PETROPOLIS, pâ-trô-pô-lês. A city in the State of Rio de Janeiro, Brazil, situated in a mountainous region about 20 miles north of the city of Rio de Janeiro. It is an attractive place, with a healthful climate, and contains a palace, a number of magnificent villas, hotels, and parks. It is the summer residence of the wealthy class of Rio de Janeiro and besides is of considerable industrial importance, having a number of cotton and silk mills. It was colonized by Germans in 1845 and still has a large German element in its population. Emperor Pedro II favored the city and made it the summer home of the court. Pop, 1913 (est.), 30,000.

PETROSINO, pët'rô-zë'nô, JOSEPH (1861-1909). An American detective, born in the Province of Salerno, Italy. He came to the United States in 1865, entered the police department of New York City in 1883, and in time became especially valuable for his skill in tracking Italian (often Sicilian) criminals. In 1905 he was appointed chief of a special squad of detectives to deal especially with black-mailers and murderers belonging to the so-called "Black Hand" associations. The zeal and success with which he carried on his work incurred the violent hatred of the members of these criminal societies, and when in Sicily in 1909 on a secret mission he was assassinated at Palermo on March 13. Petrosino received a public funeral in New York City in recognition of his service to the community.

PETROVSK, pyë'trôfsk'. Capital of a district in the Government of Saratov, Russia, 93 miles northwest of Saratov (Map: Russia, G 4). The manufacture of flour and butter is extensively carried on. There are many brick-yards. Pop., 1897, 13,200; 1910, 19,346.

PETROVSKOYE, pyë'trôf'skoi-e. A village in Russia. See BUTULINOVKA.

PETROZAVODSK, pyë'trô-zâ-vôtsk'. The capital of the Government of Olónetz, Russia, situated on the west shore of Lake Onega, about 190 miles northeast of St. Petersburg (Map: Russia, D 2). It has a Gymnasium, a theological seminary, and a famous government cannon foundry. The town grew up around an

iron foundry established in 1703 by Peter the Great. Pop., 1910, 15,420.

PETRUCCI, pà-trō'chē, OTTAVIANO DE' (1466-1539). An Italian music printer, born at Fossombrone, near Urbino (Lat. *Forum Sempronii*, from which Petrucci adopted the name Petrucci Forosempronensis). He improved the art of Hahn and Reyser to such an extent that he may almost be regarded as the inventor of printing music with movable type. The Council of Venice gave him a monopoly of his invention for 20 years (1498-1518), and from 1501 to 1511 he developed his discovery with profit to himself, but finally attempted experiments that proved too costly and so was compelled to sell his privilege and business to Amadeo Scotti and Niccolo da Rafael, after which he returned to his native town. Securing a privilege for the Papal States for a term of 15 years, he commenced work again in his home town, but with very much inferior results. Petrucci prints are exceedingly rare and are very valuable. Consult A. Vernarecci, *Ottaviano de' Petrucci* (Bologna, 1882).

PETRUCCI, PANDOLFO (?-1512). A Siennese tyrant or, more exactly, political boss. He was a poor noble by birth, but marriage to an heiress gave him money and influential connections. After four years in banishment he came back in 1487, over the city wall, with a group of armed friends, and within 10 years they had become virtually the government of the city. Petrucci's times were those when the smaller Italian states were being swallowed up by the larger, which in turn France and Spain were eager to appropriate. Petrucci, who managed to maintain the independence of the little State of Siena in the midst of such new and serious perils, was cunning and ruthless (he executed his father-in-law, who had plotted his death), but relied on diplomacy and finesse rather than force. His descendants lacked his talent and failed to make him the founder of a dynasty. Consult G. A. Pecci, *Memorie storico-critiche della Città di Siena che servono alla vita di Pandolfo Petrucci* (Siena, 1755), and U. G. Mondolfo, *Pandolfo Petrucci, signore di Siena* (ib., 1899).

PETRUCHIO, pē-trō'chi-ō or -ki-ō. The husband of Katharine in Shakespeare's *Taming of the Shrew*.

PETRUNK'EVITCH, IVAN ILITCH (1844-). A Russian statesman, born in the Government of Tchernigov. In 1868 he was elected to the district and later to the government assembly. From 1869 to 1879 he was a member of the local judiciary. In the latter year, however, as the result of his radical declarations in favor of reforms, he was banished to Tver, where he continued to take an active part in political matters. In 1886, permitted to return to the Government of Tchernigov, he was elected to the local assembly. Moving again to the Government of Tver, he resumed there his political activity, which led to his second exile. Subsequently he took a very active part in the liberation movement of 1904-06. He was vice president of the Zemstvo congresses at St. Petersburg and Moscow (1904). In 1905 he became leader in the Constitutional Democratic party and was elected to the Duma of 1906, in which he made the opening address. After the dissolution of the first Duma, he was one of the deputies to the Viborg Convention, at which, too, he made the opening address defending the course of

that famous assembly. For this he was imprisoned, together with the rest of the 160 delegates. See RUSSIA.

PETRUS CAMPANEN'SIS, or KAMPANA. See KEMPENER, PETER DE.

PETTENKOFEN, pēt'en-kō'fen, AUGUST VON (1822-89). An Austrian genre and military painter and lithographer, born in Vienna. He studied at the Vienna Academy under Kupelwieser, was a cavalry officer for five years, then devoted himself to painting and lithography. He wandered through Hungary, Germany, France, and Italy and alone among his anecdotic contemporaries observed nature and the life of the people from a purely pictorial standpoint. His art is contemplative and tender and his color delicately harmonious; in his rendering of values and treatment of light he attacked the problems solved later by Manet. His favorite subjects are men and women absorbed in toil, the common soldier, and the work horse. Excellent examples of his paintings are: "The Volunteers" and the "Ambulance Wagon," Metropolitan Museum, New York; "A Slavonic Team," New Pinakothek, Munich; "Resting Gypsies," Berlin Gallery; and "The Street Fight" and other paintings and sketches in the Vienna Modern Gallery. Pettenkofen's lithographs include many fine illustrations for military works. He was a member of the Vienna and Munich academies and was knighted in 1875.

PETTENKOFER, pēt'en-kō'fēr, MAX VON (1818-1901). A German chemist and hygienist, born in Bavaria. He studied medicine and chemistry at Munich and later under Liebig at Giessen. In 1847 he became professor of medical chemistry at Munich. His famous researches formed the foundation of the science of experimental hygiene. At his instance chairs of hygiene were founded at the Bavarian universities, and he himself accepted the professorship at Munich in 1865. He became coeditor of the *Zeitschrift für Biologie* in 1864 and was for years one of the editors of the *Archiv für Hygiene*, which he founded in 1883. In 1889 he was chosen president of the Bavarian Academy of Sciences. He is best known for his experimental researches on the ventilation of dwellings, on respiration and the metabolic assimilation of food, and on cholera. The researches on metabolism were carried out, jointly with Karl Voit, by the use of an apparatus of Pettenkofer's invention, which permits the determination of the amount of atmospheric oxygen used up by the body and the amount of carbonic acid and water vapor given off. As to cholera Pettenkofer was the first to show that the symptoms of that disease are caused by the activity of a specific germ, which may be disseminated through ground water, that the spread of the disease is dependent to a great extent on local climatic and sanitary conditions, and that infection is due largely to individual predisposition. Most of his contributions appeared in the *Zeitschrift für Biologie*. He published: *Untersuchungen über die Verbreitungsart der Cholera* (1855); *Ueber den Luftwechsel in Wohngebäuden* (1858); *Zum gegenwärtigen Stand der Cholerafrage* (1887); etc. His *Beziehungen der Luft zu Kleidung, Wohnung und Boden; Was man gegen die Cholera thun kann; Populäre Vorträge*, and other works have passed through several editions.

PETTERSEN, pēt'tēr-sēn, HJALMAR (MARIUS) (1856-). A Norwegian bibliographer

and librarian, born in Christiania and educated there at the university, in the library of which he afterward held important positions. His extensive bibliographical studies, especially in Norwegian literature, resulted in various works, the most important being *Bibliotheca Norvegica* (1899 et seq.), which in scope and minute accuracy is without parallel in Norwegian bibliographic literature of Norway. Three volumes had appeared up to 1915.

PETERSSON, pět'tér-són, SVEN OTTO (1848-). A Swedish chemist, born at Göteborg. He studied at Upsala and Wiesbaden, and in 1872 obtained the doctorate at Upsala, where he became docent in physical chemistry (1874). In 1881 he was appointed director of the chemical laboratory at the College of Stockholm and from 1884 to 1909 served as professor there. In 1902 he became director of the hydrographic-biological commission. For years he did important work in physical and inorganic chemistry and in hydrography, publishing the results in periodicals. He constructed several important instruments. In 1900 he became a member of the Nobel prize committee in chemistry.

PETTIE, pět'i, JOHN (1839-93). A Scottish genre, historical, and portrait painter, born in Edinburgh. He studied under Lauder at the Trustees' Academy in Edinburgh and after Orchardson (q.v.) was chief of the group of painters who under Lauder's influence aided powerfully in the development of modern Scottish art. In 1863 he moved to London and for a while had a studio with Orchardson. His figures are usually in the costume of the sixteenth or seventeenth century. His compositions are animated, purely pictorial in motive, and full of dramatic power; his execution is brilliant and his color rich and resonant. His works include: "A Challenge"; "The Chieftain's Candlesticks"; "What d'ye lack" (1861); "Arrest for Witchcraft" (1866, Melbourne Gallery); "The Death Warrant" (1879, Hamburg Kunsthalle); "Treason" (Sheffield Gallery); "The Vigil" (Tate Gallery, London); and "The Ultimatum" (1892). His best portraits are those of Windham as "David Garrick," of himself (Tate Gallery), and of "Sybil" (1891). He was elected to the Royal Academy in 1874. Consult the biography by Hardie (London, 1908).

PETTIGREW, JAMES BELL (1834-1908). A British physiologist, born at Roxhill, Lanarkshire, Scotland. He received his education in Glasgow and Edinburgh, graduating in medicine in 1862. From 1862 to 1868 he was assistant curator of the Hunterian Museum in London. Joining the staff of Edinburgh University in 1869, he finally became Chandos professor of anatomy and, in 1875, dean of the medical faculty. Among his works may be mentioned: *The Physiology of the Circulation in Plants, in the Lower Animals, and in Man* (1872); *Animal Locomotion, etc.* (1874), translated into German and French; and articles on "Crystals, Den-drites, and Spirals" (1901) and "Swimming and Flying" (1904), reprinted. His best-known work, *Design in Nature*, was published posthumously (3 vols., 1908). It is monumental in scope, aiming to prove "that inorganic and organic matter, and physical, vital, and mental force are not opposed to each other; that a Creator, Prime Mover, or First Cause is necessary to produce dead and living matter."

PETTIGREW, JAMES JOHNSTON (1828-63). An American soldier, born in Tyrrell Co., N. C.

He graduated at the University of North Carolina in 1847 and was appointed by President Polk assistant professor in the Naval Observatory. In 1848 he resigned, to study law. He visited Europe in 1850 and for a time acted as secretary of the Spanish Legation. In 1852 he returned to the practice of law in Charleston, S. C., and was a member of the Legislature in 1856. He joined the Sardinian army in 1858, but the armistice of Villafranca destroyed his hopes of active service. After a visit to Spain he returned to Charleston to practice law and was prominent in militia affairs. He took part on the Confederate side in the first operations of the Civil War at Castle Pinckney and Morris Island, and in May, 1861, was made colonel of the Twenty-second North Carolina Regiment. In the spring of 1862 he was promoted to brigadier general and assigned to the Peninsula. He was wounded and captured at Seven Pines (May 31) and after exchange was assigned to command a new brigade of North Carolinians at Petersburg. In the fall of 1862 he made an unsuccessful attempt to recapture Newbern, N. C., and he opposed Stoneman before Richmond early in 1863. At the battle of Gettysburg (July 1-3) his brigade, a part of Heth's division, A. P. Hill's corps, opposed the famous Iron Brigade the first day and lost one-third of its numbers. One regiment, the Twenty-sixth North Carolina, lost in killed and wounded 584 out of 820. On the third day he commanded Heth's division. In the famous charge on Cemetery Ridge this division formed the left of the assaulting force. Owing to a sharp change in the direction of the stone wall, at the Bloody Angle, which made it 80 yards farther from the Confederate lines, it has been officially shown that men of this division went at least 40 yards farther up the hill than those of Pickett's. Pettigrew's brigade had 935 men left and was commanded by a major, the only field officer left. On the retreat Pettigrew was mortally wounded by Federal cavalry at Falling Waters, July 14, and died at Bunker Hill, Va., July 17. For his part in this battle, consult *North Carolina Regiments, 1861-65*, vol. v, published by the State (1901).

PETTY, SIR WILLIAM (1623-87). An English political economist, born at Romsey in Hampshire. After studying at the Jesuit College at Caen in Normandy he returned to England and entered the royal navy. On the outbreak of the Civil War he retired to the Continent and studied at Utrecht, Amsterdam, Leyden, and Paris. He returned to England and took the degree of doctor of physic at Oxford in 1649 and was soon after appointed fellow of Brasenose College. In 1651 he became professor of anatomy and in 1652 was appointed physician general to the army in Ireland. His intimacy with Henry Cromwell and other members of the Cromwellian party involved him in the downfall of the Protectorate, but he soon won the confidence of Charles II. He was one of the founders of the Royal Society, which was incorporated in 1662. He was one of the authors of *Natural and Political Observations*, published in 1662, which was the first book on vital statistics ever written. Ten years later his *Political Anatomy of Ireland* appeared. His later works were: *Quantulumcumque Concerning Money* (1682); *Observations upon the Cities of London and Rome* (1687); and a number of *Essays in Political Arithmetick*, published between 1687 and 1690.

PETTY BAG OFFICE. An office formerly attached to the Court of Chancery in England for the care of suits for and against solicitors and officers of the court; for all judicial matters relating to statutes, recognizances, writs of *scire facias* and other prerogative writs, and to certain other matters relating to the crown. The name was derived from the ancient practice of keeping the writs and returns in a little sack or bag (*in parvâ bagâ*). A great deal of miscellaneous business was also transacted in the Petty Bag Office under the general authority of the Lord Chancellor and Master of the Rolls. When the jurisdiction of the Court of Chancery was transferred to the High Court of Justice by the Judicature Acts in 1874, the office of the clerk of the petty bag was abolished, and his duties and powers are now vested in the senior clerk of the Crown Office department of the Central Office.

PETTY-FITZMAURICE, HENRY CHARLES KEITH. See LANSDOWNE, H. C. K. PETTY-FITZMAURICE, MARQUIS OF.

PETTY FITZMAURICE, WILLIAM, EARL OF SHELburne. See SHELburne.

PETTY OFFICER. A term applied in the navy to the men of the enlisted force who are appointed to positions below the rank of warrant officer; these positions or "ratings" correspond to the noncommissioned grades of the army, but they are much more numerous. The rates of pay are from \$30 to \$70 per month. (See PAY AND ALLOWANCES, *United States Navy*.) The most capable and deserving petty officers are promoted to warrant rank as vacancies occur in the grades of boatswain, gunner, and carpenter; and, if exceptionally meritorious and well informed and they pass the necessary examinations, they may then be commissioned ensigns in the regular line of promotion, but not more than 12 may be commissioned in any one year.

PETTY SESSIONS. An English court, constituted by two or more justices of the peace or a borough magistrate, when sitting for the trial of certain minor criminal cases or for the preliminary hearing and commitment for trial of persons accused of graver crimes which can be tried only at quarter sessions. It corresponds closely to the magistrate's court, or the police court, of most American cities. The jurisdiction of the justices in petty sessions is mainly over violations of certain special acts, such as those concerning poaching, vagrancy, bastardy proceedings, absconding workmen, apprentices, poor laws, etc. One of the important functions of this court is to hear and investigate charges for all indictable offenses and to commit the accused person for trial at quarter sessions if a probable case is made out against him. The jurisdiction of petty sessions and special sessions is practically the same, except that the latter court is held only on special notice. Appeals from petty sessions are heard in the court of quarter sessions. See JUSTICE OF THE PEACE; QUARTER SESSIONS; SPECIAL SESSIONS.

PETU'NIA (Neo-Lat., from Brazilian *petun*, tobacco). A genus of plants of the family Solanaceæ, natives of South America, and during the nineteenth century introduced into cultivation in other countries for their beautiful flowers. Although naturally perennials, they are generally cultivated as garden annuals. The slightly viscid foliage emits a peculiar, often disagreeable odor, especially in the evening or during stormy weather. The common garden

petunias are mostly hybrids of *Petunia nyctaginiflora* and *Petunia violaceæ*, which themselves are not frequently cultivated. *Petunia nyctaginiflora* is a stout species with white flowers; *Petunia violaceæ*, a trailing plant with purplish violet blossoms. The number of varieties is very large and includes single and double flowered forms, plain or variegated, with innumerable variations in color from pure white to deep violet, through rose, purple, pink, and many other shades. The finest flowers are produced on deep rich soils in sunny situations. They are well adapted for beds and borders and are also grown as house and conservatory plants. Since seedlings do not come true to the parent plant, the choice varieties are propagated by cuttings. These are put in sandy soil with bottom heat in August, potted singly after they have rooted, wintered in the greenhouse, and set out in the open in late spring.

PETZOLDT, pět'sólt, JOSEPH (1862-). A German Positivist philosopher, born in Altenburg and educated at the universities of Jena, Munich, Geneva, Leipzig, and Göttingen. He taught in Berlin Gymnasiums and in 1904 became privatdozent in the Berlin-Charlottenburg School of Technology. Among his works, which show traces of the influence of Avenarius, are: *Maxima, Minima, und Oekonomie* (1891); *Einführung in die Philosophie der reinen Erfahrung* (1900-04); *Das Weltproblem* (1906).

PEUCER, poi'tsér, KASPAR (1525-1602). A German scientist and scholar, son-in-law of Melanchthon. He was born at Bautzen and studied at Wittenberg, where he was made professor of mathematics in 1554 and of medicine in 1560. But in 1574 he was removed from his position as rector of the university, because of his intimate relations with Crypto-Calvinists. After 12 years' imprisonment Peucer was freed and became court physician to the Prince of Anhalt. He wrote on astronomy, geometry, and medicine and edited some of Melanchthon's letters (1565 and 1570); his best-known work is the history from Charlemagne to Charles V, which appeared as part iii in Melanchthon's *Chronicon Carionis* (1562-65).

PEUCKER, poik'ér, KARL (1859-). A German geographer. He was born in Bojanowo, Posen, and was educated at the universities of Breslau and Berlin. After several years as a private tutor, in 1891 he went to Vienna to work for the map makers Artaria & Co. In 1910 he began to lecture in the Vienna Museum of Commerce, and in 1912 he became scientific adviser to the Scheimpflug Aërophotogrammic Institute. He published an annual, *Atlas für Handelsschulen und Akademien* (1894 et seq.); an original map of Zante (1891), with Partsch; a map of eastern Asia (1904); *Kleines Ortsalewikon von Oesterreich-Ungarn* (1904); *Physiographik* (1908); *Erste Proben einer raumtreuen Karte* (1910); *Hohenschichtenkarten* (1911); and partial maps of Italy, Germany, and Austria for the 1:200,000 aeronautical map of the world.

PEURBACH, or PEUERBACH, GEORG VON. See PURBACH.

PEUTINGER, poi'ting-ér, KONRAD (1465-1547). A German antiquary, born at Augsburg. He studied law at Padua and at 28 became syndic of his native city, which he represented in several Diets, notably that of Worms in 1521. Emperor Maximilian made him Imperial counselor. His writings on classical antiquities were

very valuable; the most important is *Inscriptiones Romanæ* (1520). He is best known as owner of the *Tabula Peutingeriana* (see PEUTINGERIAN TABLE). Consult Herberger, *Konrad Peutinger in seinem Verhältnis zu Kaiser Maximilian* (Augsburg, 1851).

PEUTINGERIAN (pū'tin-jér'i-an) **TABLE** (Lat. *Tabula Peutingeriana*). The name given to a most interesting ancient document, which exhibits the military roads of the Roman Empire and of the world known to the Romans. It is not, properly speaking, a map, no regard being paid to geographic position or the extent of countries. The great lines of road are laid down in a narrow strip, as if nearly parallel, all proceeding from Rome as a centre; and as to rivers, all that appears is whether they cross the road from left to right or from right to left of the traveler proceeding from Rome. The Mediterranean and other seas are represented by mere narrow channels. A small house is the mark for a town; important towns and military stations are distinguished by walls and towers. Rome, Constantinople, and Antioch are each represented by a circle, within which is a human figure seated; in the case of Rome the figure is crowned. Until recently a portion of the only copy of this valuable relic of antiquity known to exist was evidently wanting, as it terminated abruptly on the west at the confines of Spain and included only the eastern parts of Britain. In the east it traces roads through India to a number of places of trade as far as the mouths of the Ganges. It is on parchment and, as described in all the publications devoted to it, 21 feet in length and about 1 foot wide. The extant document seems to be a thirteenth-century copy of an original made in the second or the third century; this original itself owed much to Agrippa's map of the world. It was found in the library of the Benedictine monastery at Tegernsee, in Upper Bavaria, in the fifteenth century, by Konrad Celtes, who bequeathed it to Konrad Peutinger of Augsburg, a zealous antiquary and one of the earliest writers on the Roman and other antiquities of Germany. Peutinger began to prepare a copy of it for publication, but died before he could accomplish his purpose, which, however, was partially executed by Mark Welser, in his *Fragmenta Tabulæ Antiquæ ex Peutingerorum Bibliotheca* (Venice, 1591). The ancient document itself remained in the hands of the Peutinger family and attracted no further notice till it was offered for sale in 1714 and purchased by Prince Eugene, who presented it to the Imperial Library of Vienna, in which it still remains. An exact copy of it was published at Vienna in 1753, with an introduction and index by F. C. von Scheyb. It was again published as an appendix to Katanetsch's *Orbis Antiquus* (Budapest, 1825), and at the request of the Academy of Munich a revised edition was published by Konrad Mannert (Leipzig, 1824). Since that time a leaf detached from the sheets forming the map has been found in the Imperial Library at Vienna. Consult: Miller's edition of the *Tabula* (Ravensburg, 1868), and Desjardins' (Paris, 1869-71); Philippi, *De Tabula Peutingeriana* (Bonn, 1876); Dettelsen, *Ursprung, Einrichtung und Bedeutung der Erdkarte Agrippas* (1906); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. iii (6th ed., Leipzig, 1913); Martin Schanz, *Geschichte der römischen Literatur*, vol. ii, part i (3d ed., Munich, 1911). See Plate of MAP.

PEVERIL OF THE PEAK. A novel by Sir Walter Scott (1823). It is a story of the Popish Plot in the reign of Charles II.

PEW (OF. *pui, puy, poi, peu*, elevated place or seat, hill, mound, *puye*, elevated railed balcony or gallery, from Lat. *podium*, balcony, from Gk. *πόδιον*, dim. of *πούς*, *pous*, foot). An inclosed seat in a church, appropriated to a person or family. Such seats were in use in English churches some time before the Reformation. They were originally plain fixed benches, with partitions of wainscoting about 3 feet high and sides of the width of the seat, paneled or carved. In the later Reformation period and probably under the influence of the Puritans, who, objecting to some parts of the service which they were compelled to attend, sought means to conceal their nonconformity, pews grew into large and high inclosures, containing from two to four seats and fitted with doors, desks, and cushions. At first pews seem to have been assigned only to the patrons of churches, but gradually the system of appropriation was extended. It would appear by the common law of England that every parishioner has a right to a seat in the church, and that the churchwardens are bound to provide for each one as best they can. So, also, by the common law, the right to a pew is only a right to use it for the services of the church and at times when it is open for use, subject to the regulations of the church; and there is no right of access to it for any other purpose except repairs. Ordinarily in England, as in the United States, pews and the control of sittings are vested in the church authorities (in the Established church in England in the bishop, or ordinary; in other churches there and generally in America, in a board of trustees), subject to be let for a longer or shorter term to parishioners or other worshipers. But from an early date the courts in England recognized the right and title of individuals to specific pews which they and their ancestors had occupied from time immemorial. This prescriptive right came in course of time to be recognized as a species of real property an incorporeal hereditament, which would descend to the heirs of the owner and which might be alienated like any other property. It was however, subject to the control of the ecclesiastical authorities, who could rebuild or rearrange the pews in the church, or tear down the church and rebuild it, or sell it and build another church on the same or on another site, without the consent of the pewholders. In such cases however, by the weight of authority, a pewholder would be entitled to a pew of like character in the new edifice. However, if a church corporation is dissolved, the pewholders are entitled to have the value of their pew rights returned out of the church funds. The common law above set forth prevails in most of the United States. A few States have passed statutes expressly making pew rights real property, and in others the statutes define such rights as personal property. In most churches, however, pews are let from year to year and the pewholders merely have temporary possessory rights. Consult: G. H. F. Oliphant, *The Law of Pews in Churches and Chapels* (London, 1850); A. Heales, *History and Law of Church Seats and Pews* (London 1872); Sir R. J. Phillimore, *Ecclesiastical Law of the Church of England* (2d ed., ib., 1895) and the authorities referred to under **REAL PROPERTY**.

PEWEE (onomatopoetic name). Any of several small olive-green or brown American tyrant flycatchers (q.v.). The common pewee or phoebe bird (*Sayornis phoebe*) measures about 12 inches across the extended wings. It is brown on the back, darker on the head, with a yellowish-white breast and belly, quills brown, slightly edged with a lighter color. Its principal habitat is the Middle and Atlantic States. It comes north in April and usually hatches a brood by the middle of May and another by the first of August. In October it returns to the south, migrating at night. It placed its nest originally on a ledge of rocks or plastered it bracket-like against the surface of a mossy cliff, but now more frequently chooses a beam or rafter of a building or bridge. The nest is made of mud, grass, mosses, and the like and is lined with down and other soft materials; but these materials seem so favorable for the breeding of parasites that the second brood is often raised in a new nest. The pewee lays four to six eggs, white, rarely with a few reddish spots at the larger end. The hatching takes about 13 days, and in a few days more the young birds leave the nest. The pewee occurs as far west as eastern Nebraska. Its food consists wholly of insects, captured usually on the wing. Its plaintive note, *phæbe*, is well known. Two allied species, Say's pewee (*Sayornis sayus*) and *Sayornis nigricans*, occur in the Western States. The former is grayish brown with cinnamon belly and black tail, while the latter is blackish with a white belly.

The very familiar wood pewee (*Contopus*, or *Myiochanes*, *virgens*) measures from 10 to 11 inches across the outspread wings, with the color of the back much like that of the phoebe bird, but it has two pale grayish bands across the wings, a narrow whitish circle around the eyes, a greenish-yellow belly, and grayish throat and breast. Its flight is rapid, with sudden sweeps when darting after its insect prey, which it pursues in the shade of the orchard or woods. Its note is much slower and more plaintive than that of the phoebe and is more frequently single-syllabled. It comes north two or three weeks later than the phoebe, going as far north as New Brunswick and Nova Scotia and retreating as far south in the winter as New Granada. The nest is saddled upon the branch of a tree and is notable for the skill with which it is covered with lichens, so that it very closely resembles a natural wart on the limb. The eggs are four or five, light yellowish with reddish and lilac spots at the larger end. The pewee is very courageous, defending its nest against all intruders. Two broods are raised where the season is long enough. The Western wood pewee (*Contopus*, or *Myiochanes*, *richardsoni*), which resembles the wood pewee except in being darker and in having shorter legs, longer wings, and larger feet, is found from the sixtieth parallel of latitude to Panama and from the great plains to the Pacific.

The least pewee (*Empidonax minimus*) is a small bird, present in every village garden and roadside, and the type of a genus containing several small similar species. It makes a neat nest of hempen materials placed in the crotch of a small tree. Consult general works on American ornithology. See Plate of TYPICAL FLYCATCHERS with the article FLYCATCHER; and also the Colored Plate of EGGS OF AMERICAN SONG-BIRDS.

PEWIT. A British name for several birds having a cry more or less resembling these syllables, especially the lapwing (q.v.) and certain gulls.

PEWTER (OF. *peutre*, *peautre*, *piautre*, Fr. *peautre*, probably a variant of OF. *espeautre*, pewter, from LGer. *spialter*, Eng. *spelter*, zinc). An alloy of tin with lead, antimony, or bismuth, of which there are three common varieties: ley or common pewter, consisting of tin, 4 parts, and lead, 1 part; plate pewter, consisting of tin, 90 parts, antimony, 7, bismuth, 2, and copper, 2; and trifle pewter, consisting of tin, 79 parts, antimony, 15, and lead, 6. Pewter is a soft metal, similar in appearance to tin, but somewhat duller and darker in color. It was formerly extensively used for making plates, teapots, and other domestic utensils, but, on account of the poisonous character of the lead, prohibitory measures have been adopted by the governments of several countries, and consequently other alloys have largely taken its place. Old pewter, however, is now highly prized by collectors of antiques. Consult: A. L. Liberty, *Pewter and the Revival of its Use* (Washington, 1905); E. J. Gale, *Pewter and the Amateur Collector* (New York, 1909); C. A. Markham, *Pewter Marks and Old Pewter Ware, Domestic and Ecclesiastical* (ib., 1909).

PEYER'S (pi'érz) **GLAND.** One of the glands forming aggregations of solitary lymphoid follicles, first discovered by Johann Konrad Peyer, a Swiss anatomist (1653-1712), principally found in the ileum, the lower division of the small intestine, and connected with the function of absorption. (See DIGESTION.) The solitary glands which are not aggregated have essentially the same structure as those which make up the patches of Peyer, or Peyer's glands.

PEYOTE, pá-yó'tá (Sp., from Aztec *peyotl*, caterpillar, in allusion to the downy growth upon the root of the southern variety). The Mexican name given to several species of plants used by the Indians of the plains and central plateau to produce a peculiar kind of mental exhilaration. The practice existed among the native tribes from the Arkansas River as far south at least as the city of Mexico, and in a few places had crossed the main divide to the Pacific coast. The southern plant, to which the name was originally applied by the Aztecs, is a species of *Compositæ*, the active principle being in the root. The variety best known, and the use of which is everywhere found from about the valley of Mexico northward to the Arkansas, is a small cactus, botanically identified as *Lophophora williamsii*. The plant grows abundantly in a wild state along the Rio Grande and southward, and is gathered by the Indians, who use the dried top, called a "button." It is taken at intervals during a ceremony which lasts throughout the night. A small gourd rattle and a tiny water drum are the chief regalia. The effect is to exhilarate and intensify the imaginative faculties, producing a pleasant dreaminess, without, however, overmastering the will power or producing a disagreeable reaction later. Many observers assert that the moral tone of the users is heightened and that it effectively checks tendencies towards alcoholism. In recent years the ceremony, a peyote religion, has spread through Oklahoma and northward among the Plains tribes. The ritual has been described by A. L. Kroeber, in *Bulletin of the American Museum of Natural History*, vol. xviii. Consult

also Safford, in *Journal of Heredity*, vol. vi, no. 7.

PEYRÈRE, pà'tar', ISAAC DE LA. See **PRE-ADAMITES**.

PEYRON, pà'rôn', VITTORE AMADEO (1785-1870). An Italian philologist, born at Turin. He studied under the Abbé Valpergo di Caluso, and in 1815 succeeded him as professor of Oriental languages at Turin. He translated Thucydides into Italian, edited *Fragmenta Ciceronis Orationum* (1824) and other classical texts, and was a member both of the Turin Academy of Sciences and of the French Institute. It was he who first placed the study of Coptic upon a scientific basis by the *Lexicon Linguae Copticae* (1835; new ed., 1896), with the supplemental *Grammatica Linguae Copticae* (1841). See J. E. Sandys, *A History of Classical Scholarship*, vol. iii (Cambridge, 1908).

PEYRONNET, pà'rô'nâ', CHARLES IGNACE, COUNT (1778-1854). A French politician, born at Bordeaux. As an advocate in his native town he displayed great zeal for the cause of the Bourbons during the decline of Napoleon's power. In 1815 he was made president of the Court of First Instance at Bordeaux and later became Procurator General at Bourges. In 1821 he was elected to the Chamber of Deputies and in the same year was named Minister of Justice—a post which he held till 1828. He was one of the most prominent champions of reaction during this period, his term of office being marked by the enactment of a rigorous press law (1822) and the passage of the law against sacrilege (1825). In May, 1830, he became Minister of the Interior under Polignac and in that capacity signed the famous Ordinances which brought about the July revolution (q.v.). Peyronnet fled, but was arrested at Tours and condemned to imprisonment for life on the charge of treason. He was pardoned in 1836. During his captivity he wrote *Pensées d'un prisonnier* (1834) and *Histoire des Francs* (1835).

PEYROUSE, PHILIPPE PICOT DE LA. See **LA PEYROUSE**, P. P. DE.

PÉZENAS, páz'nás'. A town in the Department of Hérault, France, on the Peyne, a branch of the Hérault, 25 miles west-southwest of Montpellier (Map: France, S., H 5). It manufactures spirits, wine, and cognac, and the prices which prevail at its weekly market of these articles are registered throughout Europe. Pop., 1901, 7073; 1911, 6940.

PEZET, pà-thât', FEDERICO ALFONSO (1859-). A Peruvian diplomat, born in London, educated in England and in the Military Academy at Lima. He served with distinction in the Peruvian-Chilean war, was wounded and taken prisoner, but was released later and returned to service. He was Spanish editor of the *Panama Star and Herald* from 1884 to 1886. Entering the Peruvian diplomatic service in 1886 as Consul at Panama, he later served in like capacity at Liverpool, London, and New York. He was chargé d'affaires and Consul General at Panama (1904-09), Envoy Extraordinary and Minister Plenipotentiary to Panama (1909), and special envoy extraordinary to Central America and Panama (1909-12). In 1912 he was named Minister to the United States. Pezet received the degree of LL.D. from Brown University in 1914. He became a member of numerous learned societies and contributed to American and European periodicals. His writings include *Peru: Its Commerce and Resources* (1893), *The Ques-*

tion of the Pacific (1901); *What the Panama Canal Means to Peru* (1911).

PEZI'ZA (Neo-Lat., corrupted from Lat. *pezica*, from Gk. *πέσις*, *pezis*, sessile mushroom). A genus of the Ascomycetes (q.v.) characterized by a cuplike ascocarp (apothecium), whose hymenial lining is brightly colored. The mycelium grows on decaying wood, humous soil, etc., and one of the best-known species is the scarlet cup, so named from its scarlet lining.

PEZZA, pèd'zà, MICHELE. See **FRA DIAVOLO**.

PFÄFERS, pfa'fêrs. A village and watering place in the Canton of Saint-Gall, Switzerland, in a deep gorge of the mountain stream Tamina, 2½ miles southwest of Ragatz (Map: Switzerland, D 2). It is 2240 feet above the sea. The water of the noted hot springs varies in temperature from 99° to 102° F., contains in small proportions carbonate of lime, chloride of sodium, and magnesia, is used for bathing, and has considerable curative qualities. The springs of Pfäfers were known as early as the eleventh century, and the present Kurhaus was erected at the beginning of the eighteenth century to replace the older buildings dating from the fifteenth and seventeenth centuries. The baths belonged formerly to the Benedictine monks and were acquired by the canton in 1838. Pop., about 600.

PFÄFF, pfäf, JOHANN FRIEDRICH (1765-1825). A German mathematician, born at Stuttgart. In 1788 he became professor of mathematics in Helmstedt, and in 1810 at Halle. He invented a method of integrating partial differential equations of the first order in any number of variables which depends on the solution of the general problem of integrating a linear homogeneous equation between the differentials. Equations of this kind are therefore called Pfaffian equations and their integration is called the Pfaffian problem.

A determinant,

$$\begin{vmatrix} a_{11} & a_{12} & \dots & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ a_{n1} & a_{n2} & \dots & \dots & a_{nn} \end{vmatrix}$$

in which $a_{ij} = -a_{ji}$, is called a *gauche*, or *skew*, determinant; if in addition $a_{11} = a_{22} = \dots = a_{nn} = 0$, it is called *gauche* or *skew symmetric*. Every such determinant of even order is the square of an integral function of its elements, which function is called a Pfaffian, it having first been discussed by Pfaff. His chief mathematical works are: *Commentatio de Orbitis et Occasibus Siderum apud Auctores Classicos Commemoratis* (1786); *Versuch einer neuen Summationsmethode* (1788); *Disquisitiones Analyticae* (1797); *Methodus Generalis Equationes Differentiarum Particularum Completi Integrandi* (Proceedings of the Berlin Academy, 1814-1815). His correspondence with Duke Karl of Württemberg, Bouterwek, and others was published in Leipzig (1853).

PFÄFFE, KONRAD DER. See **KONRAD DER PFÄFFE**.

PFAU, pfau, LUDWIG (1821-94). A German lyricist and art critic, born in Heilbronn. He studied in the universities of Tübingen and Heidelberg, edited the satirical *Eulenspiegel*, and took a prominent part in the revolt of Baden in 1848. On the suppression of the revolt, Pfau was sentenced to 22 years' imprisonment, but he escaped to Switzerland and, after spending two years in Zurich and in Bern, settled in Paris. In 1863 he returned to Stuttgart and became

editor of the *Beobachter*. His poetry is especially noted for its political satire; *Gedichte* (1846; 4th ed., 1889) and *Deutsche Sonette auf das Jahr 1850* (1849) are the most important titles. Pfau translated many French novels, among others Claude Tilliers's *Uncle Benjamin* and with Hartmann a volume of Breton folk songs (1859), but his original literary work was in the ballad and in art criticism as author of *Freie Studien* (1866), *Kunst und Gewerbestudien* (1877), and *Kunst und Kritik* (1888).

PFEFFEL, pfëf'el, GOTTLIEB KONRAD (1736-1809). A German fabulist. He was born at Kolmar and studied at Halle, where he could not finish his course because of threatening blindness. At 22 he lost his sight entirely. In 1773, with the help of his wife and the patronage of Louis XV, he founded a school for Protestants which enjoyed great success down to the Revolution. Pfeffer was employed in the council which undertook the reformation of the French educational system. His *Fabeln* (1783) follow Gellert for the most part; his complete works, including several very popular poems, as e.g., "Die Tabakspfeife," were published at Tübingen (1810-12). Consult his biography by L. B. Bernard, his great-granddaughter (Lausanne, 1866); Stöfer, *Pfeffels Verdienste um Erziehung und Schule* (Strassburg, 1878); C. Schmitt, *Zu Pfeffels 100jährigem Todestag* (ib., 1909).

PFEFFER, pfëf'ër, WILHELM (1845-). A German botanist. He was born near Cassel, studied at Göttingen (Ph.D., 1865), Marburg, Würzburg, and Berlin, and became professor of botany at Bonn (1873), at Basel (1877), at Tübingen (1878), and at Leipzig (1887). He made important contributions to botanical knowledge. His earlier work was mainly systematic and morphological, but he soon turned to plant physiology. He and Sachs stand alone as plant physiologists, both in the matter of importance of original contributions and as masterful organizers of the subject. In many phases of plant physiology Pfeffer was the pioneer and laid the broad foundations upon which the subject still stands. This is especially true of his work on osmotic pressure, one of the most thoroughly worked phases of the subject. In this connection he also laid the foundation of modern physical chemistry. From Pfeffer's data Van't Hoff later formulated the laws of osmotic pressure and showed their likeness to the laws of gas pressure. It is upon this basis that he derived his theory of dilute solutions. Pfeffer's contributions upon plasmatic membranes and irritability are scarcely less fundamental in plant physiology. His *Pflanzenphysiologie*, translated into English by A. J. Ewart (1899-1905), forms the most comprehensive treatise on the subject in the English language. His published papers are too numerous and too important to justify any attempt to select a few titles.

PFEFFERS, pfëf'ërs. A village in Switzerland. See PFÄBERS.

PFEIFFER, pfif'ër, FRANZ (1815-68). A Germanic scholar. He was born at Bettlach, Switzerland, studied at Munich, became royal librarian at Stuttgart in 1846, and in 1857 was made professor of German literature in the University of Vienna. He was one of the most important Germanists of recent times. He founded the review *Germania* and the series *Deutsche Klassiker des Mittelalters*, for which he edited

Walther von der Vogelweide (6th ed., 1880). His more valuable works are: *Der Dichter des Nibelungenlieds* (1862); *Freie Forschung* (1867); and, among many editions, *Barlaam und Josaphat* (1843), *Die deutschen Mystiker des 14. Jahrhunderts* (1845-47), an edition of the *Deutsche Ordenschronik* of Jeroschin (1854), *Marienlegenden* (new ed., 1863), and *Die Weingartner und Heidelberger Liederhandschrift* (2 vols., 1843). Consult article in *Allgemeine deutsche Biographie*, vol. xxv (Leipzig, 1887).

PFEIFFER, IDA, née REYER (1797-1858). An Austrian traveler. She was born at Vienna and began her career as a traveler by a trip to Palestine and Egypt when she was 45 years old. This expedition was succeeded by others to Scandinavia and Iceland in 1845, and in 1846-48 to Brazil, Chile, China, India, Persia, Armenia, and the Caucasus. Another journey was taken, in 1851-55, to Africa, Australia, and America, resulting in some valuable acquisitions for the Museum of Natural History at Vienna. In 1856 she set out for Madagascar, where she was imprisoned. Broken in health, she returned thence to die. Her works, which have been translated into English, include: *Journey of a Viennese to the Holy Land* (1843); *Journey to the Scandinavian North* (1846); *A Woman's Journey round the World* (1850).

PFEIFFER, RICHARD FRIEDRICH JOHANN (1858-). A German bacteriologist, born at Zduny, Posen. He studied medicine at the University of Berlin (M.D., 1880), was a surgeon in the army until 1890, and became lecturer at his alma mater in 1891 and director of the Institute for Infectious Diseases in Berlin. In 1899 he was called to Königsberg as professor of hygiene, and in 1909 to Breslau. Pfeiffer discovered the bacillus of influenza (1892) and bacteriolysis (1904), and with Kolle demonstrated antityphoid vaccination in Germany (1896). He published: *Mikrophotographischer Atlas* (1889; 2d ed., 1893), with C. Fraenkel; *Beiträge zur Protozoen Forschung* (1892); *Die Mikroorganismen* (1896), with F. G. F. W. Flügge; *Encyklopädie der Hygiene* (1902-06), with Proskauer.

PFEIL, pfil, JOACHIM FRIEDRICH, COUNT (1857-). A German explorer and colonist in Africa and New Guinea. He was born at Neurode in Silesia, studied at the Gymnasium of Göttingen, and in 1873 went to Natal. He learned the vernacular and stayed in the country four years; then (1879), after a visit to Europe, he settled in Orange Free State and with Wilson mapped the course of the Limpopo; but illness forced him to return to Germany. In 1884, having entered the employ of the Society for German Colonization, Count Pfeil went to East Africa with Peters and Jühlke, and in 1886 succeeded the latter as general manager of the company in Somaliland. This post he resigned in 1887 and entered the service of the New Guinea Company. In 1891 Pfeil became a member of the Department for Colonies, but resigned the next year. He traveled in 1892 through southwest Africa, visited Spain in 1895, Morocco in 1897-1901, the United States in 1904, East Africa in 1905, and Morocco again in 1907. His travels and explorations in the South Seas are described in his *Studien und Beobachtungen in der Südsee* (1899), and he also wrote *Vorschläge zur praktischen Kolonisation in Ostafrika* (1887); *Zur Frage der Deportation nach den deutschen Kolonien* (1900); *Warum brau-*

ohen wir Morokko? (1904); *Ein bewegtes Leben* (1911).

PFEL, MATHIEU (1863-). A German actor and theatrical manager. He was born in Cologne and made his debut there in his seventeenth year. In 1881 he went to the Victoria Theatre in Berlin and in 1882 to the Court Theatre at Dessau, to which he returned in 1886 after a year at Sigmaringen and another year in the army. In 1889 he played in St. Petersburg, in 1890 at the Berlin Schauspielhaus, and in 1892 at Breslau. Then he came to America and for some time was connected with the Irving Place Theatre in New York. From the Lessing Theatre in Berlin he went in 1901 to the Frankfurt Stadttheater. In 1905 he entered into a contract for five years as manager and actor at the Stuttgart Hoftheater, but in 1906 returned to Frankfurt. His rôles included Brutus, Götz, Macbeth, King Lear, Nathan, and Wallenstein.

PFEUFER, pfoi'fër, KARL VON (1806-69). A German physician who introduced the rational method of physical and chemical explanations for physiological or pathological conditions. He was born at Bamberg and studied medicine at Erlangen and Würzburg. After eight years of practice in Munich Pfeufer held academic positions in Zurich (1840-44), in Heidelberg (1844-52), and in Munich (1852-69). Besides his great contributions to method, which appeared in the *Zeitschrift für rationelle Medizin* (1844 et seq.), he wrote on cholera, *Ueber die Cholera-Epidemie in Mittenwalde* (1837) and *Zum Schutz wider die Cholera* (1849; 3d ed., 1854), and introduced public sanitation as a requisite in medical study.

PFISTER, pfis'tër, ALBRECHT (c.1420-c.70). A German printer, to whom the discovery of the art is sometimes wrongly attributed. It seems probable that he worked as wood engraver for Gutenberg. About 1455 he founded a press in Bamberg. There he printed Boner's *Edelstein* (1461); the *Book of the Four Histories* (Joseph, Daniel, Esther, and Ruth) (c.1462); the famous *Biblia Pauperum* (1462); and *Belial*, of the same date.

PFISTER, CHRISTIAN (1857-). A French historian, born at Bellenheim (Alsace), and educated at the lycées of Besançon and Louis le Grand and at the Ecole Normale Supérieure. He became a doctor of letters and taught at Besançon, at Nancy, and finally, as professor, at the Sorbonne. Pfister was created a Knight of the Legion of Honor. His writings include: *Etudes sur le règne de Robert le Pieux* (1885); *Le comté de Hombourg et la seigneurie de Riquewihr sous la souveraineté française* (1888); *Le duché mérovingien d'Alsace* (1892); *Catherine de Lorraine* (1898); *La fondation de la ville-neuve de Nancy* (1905); *Histoire de Nancy* (3 vols., 1909); *La Lorraine, Le Barrois et les Trois-Évêchés* (1912); *Les assemblées électorales dans le département de la Meurthe* (1912).

PFITZNER, pfits'nër, HANS (1869-). A German composer, born of German parents at Moscow. He received his first musical instruction from his father, a violinist at the Frankfurt Opera, and in 1886-90 was a pupil of Kwast and Knorr at Hoch's Conservatory. After teaching one season (1892-93) at the conservatory at Coblenz, he was for two years conductor of the opera at Mainz. In 1897 he became professor at Stern's conservatory in Berlin, in 1903-07 was first conductor at the Theater des

Westens, during the winter of 1907-08 directed the Kaim Orchestra at Munich, and then succeeded Stockhausen as director of the conservatory and general musical director at Strassburg. Because of his two music dramas, *Der arme Heinrich* (1895) and *Die Rose vom Liebesgarten* (1901), he was in certain circles proclaimed as the legitimate successor of Wagner; but neither work was able to hold the stage. However, his chamber music and vocal works with orchestra, in which he gets away from the influence of Wagner, exhibit originality and splendid attainments. His compositions include an orchestral scherzo; the ballads "Der Blumen Rache," "Herr Oluf," "Die Heinzelmännchen"; incidental music to Ibsen's *Fest auf Solhaug*, Kleist's *Küthchen von Heilbronn*, Stach's *Christelflein*; a string quartet, a piano quintet, a cello sonata, and a number of remarkable songs. Consult P. Cossmann, *Hans Pfitzner* (Munich, 1904).

PFIZER, pfiz'sër, GUSTAV (1807-90). A German lyricist and critic of the Swabian school. He was born in Stuttgart, studied at Tübingen, and in 1846 became professor at the Gymnasium in his native city. He wrote *Gedichte* (1831), *Dichtungen epischer und episch-lyrischer Gattung* (1840), and *Der Welsche und der Deutsche* (1844); translations of Bulwer and Byron; the critical work *Uhland und Rückert* (1837), and an attack on Heine which called out Heine's *Schwabenspiegel*. His poetry is more original and reflective than most of the products of the Swabian school. Among the most popular of his songs is "Meiner Heimat Berge dunkeln." Consult article in *Allgemeine deutsche Biographie*, vol. liii (Leipzig, 1907).

PFLEIDERER, pfli'dër-ër, OTTO (1839-1908). A German Protestant theologian, born at Stetten, near Canstatt. After studying theology at Tübingen he was for some time pastor at Heilbronn, and in 1870 was appointed chief pastor (*oberpfarrer*) and professor at Jena. In 1875 he was called to the chair of systematic theology at the University of Berlin. Through his lectures and writings he became known as one of the most influential representatives of liberal doctrines. His lectures in London (1885) and in Edinburgh (1894) were published in English as *Influence of the Apostle Paul on the Development of Christianity* and *The Philosophy and Development of Religion*. His other important works, in English translation, are as follows: *Paulinism* (1877); *Philosophy of Religion* (1886-88); *The Development of Theology in Germany since Kant, and its Progress in Great Britain since 1825* (original in English, 1890); *Evolution and Theology, and Other Essays* (1900); *The Early Christian Conception of Christ* (1905); *Christian Origins* (1906); *Primitive Christianity* (1906-09); *Religion and Historic Faiths* (1907); *The Development of Christianity* (1910).

PFÜGER, pfü'gër, EDUARD FRIEDRICH WILHELM (1829-1910). A German physiologist, born at Hanau. He studied at Marburg and Berlin and in 1859 became director of the Physiological Institute and professor in the University of Bonn. Pfüger made special studies on the nervous systems of lower animals and of metabolism. He and his pupils demonstrated that the oxidation of the blood, the essential work of respiration, takes place in the tissues; furthermore, he made important experiments on fertilization of eggs of different species of frogs; he also invented several physiological instru-

ments, among them the aërotonometer (1872) and the pneumonometer (1882). In 1868 he founded the famous *Archiv für die gesamte Physiologie* and he wrote, among other works, *Sensorische Funktionen des Rückenmarks der Wirbeltiere* (1853); *Ueber das Hemmungsnervensystem für die peristaltischen Bewegungen der Gedärme* (1857); *Physiologie des Elektrotonus* (1859); *Ueber die Eierstöcke der Säugethiere und des Menschen* (1863); *Untersuchungen aus dem physiologischen Laboratorium zu Bonn* (1865); *Die teleologische Mechanik der lebendigen Natur* (1877); *Ueber die Kunst der Verlängerung des Lebens* (1890); *Das Glykogen und seine Beziehungen zur Zuckerkrankheit* (1905).

PFLÜCK-HARTTUNG, pfloo'-här'tung, JULIUS VON (1848-). A German historian, best known as an authority on papal and mediæval history. He was born at Warnikow, studied at Bonn, Berlin, and Göttingen, and in 1886 became professor of history at Basel. On account of the Wohlgemuth case he resigned and went to Berlin, where in 1893 he became head of the secret state archives. He wrote: *Studien zur Geschichte Konrads II* (1876-77); *Norwegen und die deutschen Seestädte* (1887); *Acta Pontificorum Romanorum Inedita*, 748-1198 (1879-88); *Iter Italicum* (1883); in Grote's *Allgemeine Weltgeschichte* the part on the early Middle Ages (1889); *Krieg und Sieg*, 1870-71 (1895), the first of his studies of modern history; *Napoleon I., Republik und Kaisertum* (1900); *Die Bullen der Papste bis zum Ende des 12. Jahrhunderts* (1901); *Deutsche Gedenkhalle* (1906); *Weltgeschichte* (6 vols., 1907-10); *Die Papstwahlen und das Kaisertum* (1908); *Das Befreiungsjahr 1813* (1913); *Leipzig*, 1813 (1913).

PFORZHEIM, pförts'him. A town in the Grand Duchy of Baden, Germany, at the junction of the Enz, Würm, and Nagold, on the north border of the Black Forest, 16 miles southeast of Karlsruhe (Map: Germany, C 4). It has the remains of an ancient castle, formerly the residence of the margraves of Baden, a convent, and industrial and other schools. A new town hall has been erected in the market square. The Schlosskirche is a notable old structure in the Gothic and Renaissance styles, with tombs of the margraves. Pforzheim is one of the largest manufacturing centres of cheap jewelry in the world, over 22,000 workmen being employed. There are also chemical and iron works, foundries, machine shops, tanneries, and manufactures of tools, paper, and electrical apparatus. Pop., 1900, 43,097; 1910, 69,082.

PHACOPS (Neo-Lat., from Gk. φακός, *phakos*, lentil + ὤψ, *ōps*, eye, face). A genus of trilobites that furnishes several index fossils for the middle Paleozoic formations. The carapace is of oblong or elliptical form and is quite convex, with a pronounced axis and 11 thoracic segments. The head is semicircular, with its central portion or glabella large and very wide in front. The eyes are large and conspicuous and the lateral slopes of the head are steep, with their posterior corners rounded. The pygidium, or tailpiece, is large, convex, and strongly ribbed. The genus *Phacops* ranges from Silurian to Upper Devonian formations. The early European authors generally include under this generic term a number of species that are now classed under the genera *Dalmanites*, *Pterygometopus*, *Acaste*, and others. The most im-

portant species are *Phacops logani* of the American Lower Helderberg, *Phacops latifrons* of the European Devonian, and *Phacops rana*, a well-known species of the American Devonian. See TRILOBITA.

PHÆACIA (Lat., from Gk. Φαίαια, *Phaia-kia*). The country of the Phæacians, a people whom Odysseus visited in his wanderings. It was situated on the mythical island of Scheria, identified with Corcyra (Corfu), where the people had settled after having been driven out of their earlier home in Hyperia by the Cyclopes. There they led an undisturbed life of happiness, occupied with their marvelous ships, which safely traversed the sea without human guidance. Odysseus was found on the shore of the Phæacian island by the Princess Nausicaa, and hospitably received at the palace of her father, King Alcinous. This episode is described in *Odyssey*, vi-viii.

PHÆDO (Lat., from Gk. Φαίδων, *Phaidōn*) (early fourth century B.C.). A Greek philosopher, born in Elis. He was taken prisoner and brought to Athens, apparently about 400 B.C.; there he became acquainted with Socrates, who secured his ransom by one of his friends. He remained a devoted disciple of the great teacher until the latter's death, when he returned to Elis and became the founder of the Elean school (q.v.). In Athens he had been intimate, too, with Cebes and Plato. He composed dialogues, no longer extant, in the Socratic manner. Plato's dialogue which describes the death of Socrates bears Phædo's name.

PHÆDRA (Lat., from Gk. Φαίδρα, *Phaidra*). In Greek legend, the daughter of Minos (q.v.), King of Crete, and of Pasiphaë, sister of Ariadne, and wife of Theseus. Aphrodite, enraged against Hippolytus (q.v.), Phædra's stepson, for neglecting her worship, and against Phædra as being the daughter of Pasiphaë, inspired the latter with a passion for Hippolytus. On the rejection of her advances she falsely accused Hippolytus to Theseus, who prayed to his father, Poseidon, to destroy his son. Hippolytus was thrown from his chariot on the seashore and dragged upon the sands till dead. Phædra died by her own hand and Theseus learned the truth too late. This story, which seems to have been developed from the songs of Troezenian maidens to their local divinity, Hippolytus, guardian of purity, was first treated in tragedy by Euripides, in the play *Hippolytus*, whose second version has been preserved. It was also treated in a lost play by Sophocles. The Euripidean tragedy was imitated by the Roman Seneca and also by Racine, whose *Phèdre* (1677) is one of his masterpieces. Consult Euripides, *Hippolytus*, edited by Ulrich von Wilamowitz-Moellendorf (Berlin, 1891) and by J. E. Harry (Boston, 1899). Seneca's play has been translated by F. J. Miller, *The Tragedies of Seneca* (Chicago, 1907).

PHÆDRIADÆ. See DELPHI; PARNASSUS.

PHÆDRUS. A Latin fabulist. He was probably a Thracian who was carried to Rome as a slave in his childhood and brought up at the court of Augustus, who emancipated him. Under Tiberius he was exposed to great danger from the hostility of Sejanus, but lived to see that favorite's overthrow, and died at an advanced age, probably in the reign of Claudius. Five books of fables, after the manner of Æsop and called *Fabulæ Æsopice*, have been ascribed to him. Most of the fables are versifications of those of the Æsopian cycle, but many are drawn

from contemporary story. The book as we have it is a later and incomplete recension. The first edition was published at Troyes in 1596. The best later editions are those of Müller (Leipzig, 1877, with critical notes), Ramavino (Turin, 1884), and Müller (Leipzig, 1890). Consult: Hervieux, *Les fabulistes latins* (Paris, 1893-96); Bédier, *Les fabliaux* (Paris, 1893); Thiele, *Der illustrierte lateinische Æsop* (Leyden, 1905). See Æsop.

PHÆDRUS. A dialogue of Plato, in which Plato is represented walking in the woods with Phædrus and discoursing on the nature of love. The dialogue is distinguished by unusual poetic enthusiasm. The latter portion is an exposition of dialectics.

PHÆNOGAMS. See PHANEROGAMS.

PHÆOPHYCÆ (Neo-Lat. nom. pl., from Gk. *φαῖος*, *phaïos*, dusky + *φυκος*, *phykos*, seaweed), or **BROWN ALGÆ**. A group of algæ named from the color of the chromoplast, always a shade of brown, a color due to the pigment phycophæsin, which modifies or overpowers the green of the chlorophyll. The group includes the largest (kelps) and most vegetatively complex of the algæ.

The Phæophycæ are characteristically inhabitants of the colder waters of the globe, and are almost all marine, reaching their maximum development in Arctic and Antarctic oceans and along such coasts as the Pacific coast of North America, where the water for the most part is cold. The display is especially luxuriant at Cape Horn and on the rocky coasts of the North Atlantic and Pacific oceans. The brown algæ contain a large number of diverse groups, whose

(holdfast), that ends above in an expansion called the blade, which in some forms bears lateral leaflike structures. The blade is simple in the smaller forms (*Laminaria*), or perhaps split up longitudinally into segments. In many types the blade is cast off at certain periods by the development of a new one through the activity of the tissues just below the old. In other genera the blade serves as the growing region of the plant and splits off segments which take a lateral position on the stem (*Macrocystis*).

The most interesting forms on the American coast are the giant kelps of the Pacific Ocean. *Macrocystis* is reported to attain a length of 900 feet. It is easily recognized by the leaves borne on a stem about the size of a clothes line. Far more picturesque is the bladder kelp (*Nereocystis*), which consists of a flexible stalk swollen at the end into a hollow spherical float several inches in diameter. The top of the float bears long straplike leaves that extend on either side in the water and are whipped about by the wind and surf. Another interesting form is the sea palm (*Postelsia*), which grows on surf-beaten rocks and reefs and has a heavy, thick, erect stalk 12 to 18 inches high, with a thick crown of leaves that grow out and bend downward in the form of the conventional palm tree. The stalk is so tough that it may be bent over at right angles by the force of the waves without breaking. *Lessonia*, found on the coast of Chile, has stalks so heavy and thick that they have been mistaken for tree trunks when washed up on the beach. The kelps are one of the principal sources of iodine, which is obtained from their ashes, and are coming into use as a very important source of potash fertilizers.

In a very different division of the Phæophycæ are the rockweeds and gulfweeds. The former, also called wrack and bladder wrack, cover the rocks between tide marks with thick fringing growth. Most of the rockweed is *Fucus*, a form with a forkingly branched thallus, that bears swollen tips, and in some species special air bladders that serve to float the branches. The gulfweeds (*Sargassum*) have one of the most highly differentiated vegetative bodies among the algæ. The species are found in warmer waters than most brown algæ. In addition to the holdfast and branching stalk, there are delicate leaves and small berry-like air bladders on short pedicels, besides specialized portions that bear sexual organs. Certain species (as *Sargassum bacciferum*) will vegetate luxuriantly when floating in mid-ocean, thus forming the large masses of gulfweed met by ships, especially in certain warmer parts of the Atlantic.

Reproduction among Phæophycæ is made the basis of their classification into two groups—Phæosporales, characterized by the formation of zoöspores and by prevailing isogamy, and Fucales, characterized by the absence of zoöspores and by well-developed heterogamy. The sporangium is a single cell, being either a transformed vegetative cell or a special cell distinct from the vegetative body, and produces numerous laterally biciliate zoöspores. Laterally biciliate swimming cells (spores and gametes) are characteristic of Phæophycæ. In the isogamous forms (Phæosporales) the gametangia (sex organs) are many-celled, each cell producing a gamete, which resembles a very small zoöspore. Upon escaping the gametes pair and fuse and a zygospor (fertilized egg) is formed. These

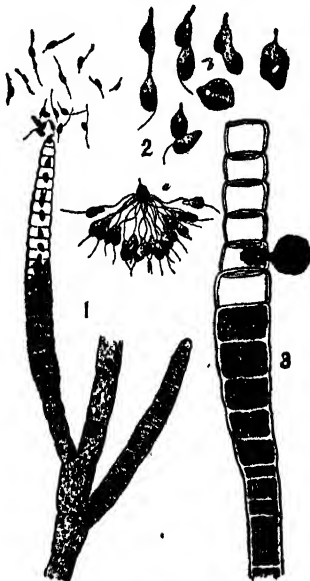


FIG. 1. BROWN ALGÆ.

1, *Ectocarpus* with gametes escaping; 2, conjugation of the same, showing (a) numerous male gametes about a single female gamete, and (b) various stages of fusion; 3, *Pylæella*, with one cell functioning as a sporangium.

representatives range from microscopic forms and delicate filamentous types (Ectocarpales) to the immense coarse kelps several hundred feet long. The Laminariales (kelps, devil's aprons) generally have a stalk (stipe) attached to the rocks by a cluster of strong rootlike processes

gametangia show interesting gradations between isogamy and heterogamy. In some cases they produce both zoospores and gametes, as judged by behavior; in other cases the pairing gametes differ in size and activity, indicating incipient heterogamy. In the heterogamous forms (Fucales) the sex organs are produced in cham-

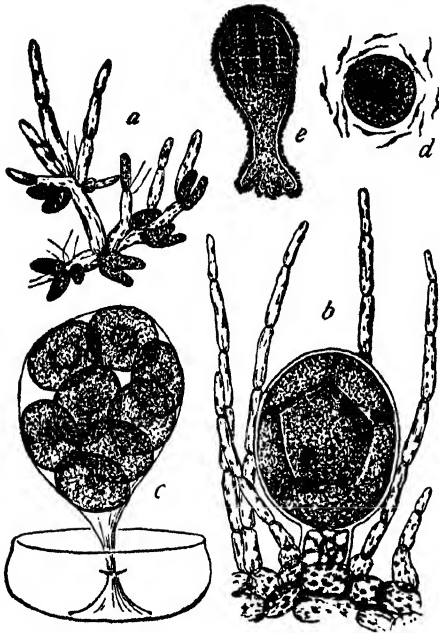


FIG. 2. ROCKWEED (*Fucus*).

a, branches bearing antheridia; b, oogonium with paraphyses; c, eggs escaping from oogonium; d, egg surrounded by sperms; e, germination of a fertilized egg.

bers called conceptacles. The female organ (oogonium) of *Fucus* produces eight eggs; in other forms the number of eggs varies from four to the usual one; but in all cases the eggs are discharged before fertilization. The male organs (antheridia) are produced in great profusion, and discharge numerous biciliate sperms, which surround the floating eggs in swarms. After fertilization the egg germinates at once and produces a new rockweed.

Consult: Farlow, *Marine Algæ of New England* (Salem, 1881); Francis Wolle, *Fresh-Water Algæ of the United States* (2 vols., Bethlehem, Pa., 1887); Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887 et seq.); Murray, *Introduction to the Study of Seaweeds* (New York, 1895); Cooke, *British Fresh-Water Algæ* (London, 1902). See ALGÆ.

PHAER, fā'ēr, or **PHAYER**, THOMAS (?1510-1560). An English lawyer and translator, educated at Oxford and at Lincoln's Inn. As a lawyer he aimed to popularize legal methods. To this end he wrote two legal handbooks. Rewarded for his service by the appointment as solicitor in the court of the Welsh marches, he settled at Kilgerran in Pembrokeshire, where he passed most of his life. He also studied medicine and published a popular book called *The Regiment of Life*, an English rendering of a French work, containing Phaer's own treatise on the plague (1546). To the *Mirror of Magistrates* (1559) he contributed a poem on a legend connected with Owen Glendower. Phaer is now

remembered chiefly for his translation of Vergil's *Æneid* into English ballad metre (7 books, 1555-58; two more books, published posthumously with the first seven, 1562). The translation was completed by Thomas Twine in 1584. Vergil had been partly translated earlier, into the Scottish dialect by Gawin Douglas (q.v.), and by the Earl of Surrey (q.v.).

PHÆSTUS, fēs'tūs. The name of a city of ancient Crete (q.v.), a few miles west of Gortyna. Excavations made there by the Italians throw important light on Minoan civilization. Here was found in 1908 a clay disk stamped with hieroglyphics which have not yet been deciphered. Consult: Angelo Mosso, *The Palaces of Crete and their Builders* (New York, 1907); the article "Archæology," the paragraph on Greece, in the NEW INTERNATIONAL YEAR BOOK for 1908 (ib., 1909); C. H. and H. B. Hawes, *Crete, the Forerunner of Greece* (ib., 1909); H. R. Hall, *Ægean Archaeology* (London, 1915).

PHÆTHON (Lat., from Gk. φαῖθων, shining). In the Greek poets, a not infrequent title of Helios, the sun god. Phæthōn, in Greek legend, is also a son of Helios and the Oceanid Clymene. To prove his descent, he went to his father's palace and insisted on attempting to drive the chariot of the sun. Unable to control the fiery horses, he was carried from his course and, approaching too near the earth, wrought great damage. Whereupon the earth cried to Zeus for help, who struck down Phæthōn with a thunderbolt and flung him into the Eridanus, a mythical river, later identified with the Po. His sisters, the Heliades, found the body, and bewailed the loss until they were changed to poplars and their tears to amber, to which the rays of the sun gave its special glow. In the lost *Phæthōn* of Euripides the youth appeared as the favorite of Aphrodite, who had placed him in charge of her temple. Consult: Ovid, *Metamorphoses*, i, 750-ii, 366; Georg Knaack, "Questiones Phaethontæ," in his *Philologische Untersuchungen*, vol. viii (Berlin, 1886); Salomon Reinach, in *Revue de l'histoire des religions*, vol. lviii (Paris, 1908); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911).

PHAETON, fā'ē-ton. A form of carriage for pleasure driving drawn by one or two horses. The term is more often applied to a low easy carriage driven by ladies and known as a pony phaeton, although there are the mail phaeton and the spider phaeton, which are high carriages suitable for park driving, with a seat in front for the driver and a companion, and a rear seat for a groom.

PHAETON. See TROPIC BIRD.

PHAGEDENA, fāj'ē-dē'nā (ML., from Lat. *phagedæna*, from Gk. φαγέδαινα, *phagedaina*, a canker, from φαγεῖν, *phagein*, to eat). A term used in surgery to designate any obstinate and rapidly destructive form of ulceration. The process usually occurs in those whose systems are exhausted by disease and whose vitality is lowered by unhygienic surroundings. When an ulcer assumes a phagedenic character it enlarges rapidly; its edges are ragged and thin; its base is covered with an unhealthy slough; the discharge is thin, reddish, and offensive, and around the whole is a zone of red and deeply congested tissue. There is no tendency towards healing. The treatment consists in the local application of caustics or of excision, and the administration of stimulants, tonics, and nutritious food, to

gether with measures to promote the most favorable hygienic conditions. The term was formerly applied to hospital gangrene and to noma (see CANORUM ORIS).

PHAGOCYTE, fäg'ô-sit (from Gk. φαγεῖν, *phagein*, to eat + κύτος, *kytos*, hollow, cell). A microbe-destroying cell residing free in the animal system. About 1883 Metchnikoff found that the individual cells of the stomachs of sponges took in solid particles of food and digested them, and this he called intracellular digestion. This function is performed by individual, free, or wandering mesoderm cells, resembling amebæ. Such wandering cells, in the cases of many of the lower animals, ingest or absorb parts of the body which become useless or by decay harmful to the organism. Besides this these free ameboid cells can and do capture and devour foreign bodies and particles; they take up anything hard or soft which occurs in or is carried into the body; and when such cells are confronted with a large mass of food material which they cannot devour singly, they usually fuse into a plasmodium, which eats up the whole available food. Such bodies as cannot be eaten are surrounded and isolated. Led by these facts, Metchnikoff threw out the remarkable theory that inflammation in the vertebrates is due to the struggle between the white corpuscles of the blood and the disease germs within it. Thus a new importance was lent to the leucocytes or white ameboid corpuscles, viz., that they act as microbe eaters or phagocytes. Metchnikoff injected fluids containing bacteria or microbes beneath the skin of various invertebrate animals. They were soon found within the ameboid cells, and if such microbes developed spontaneously in the wounds of such animals, they were absorbed in the same manner. Kovalevsky, a few years later, made similar observations in compound ascidians. When an individual died it was attacked and absorbed by the mantle cells of the colony, which also sought to destroy incoming bacteria, as was proved by experiment. Kovalevsky concluded that the passage of the wandering cells to the surface of the epithelium is a means of protection against the intrusion of agents of disease. These discoveries and theories mark an epoch in biology in its application to medical knowledge.

Consult Iliya Metchnikoff, "Researches on the 'Intracellular Digestion' of Invertebrates," in *Quarterly Journal of Microscopical Science*, vol. xxiv (London, 1884), and id., *Leçons sur la pathologie comparée de l'inflammation, faites à l'Institut Pasteur en avril et mai 1891* (Paris, 1892).

PHAGOCYTO'SIS. See INFLAMMATION.

PHALANGER, fâ-lân'jër (Fr. *phalanger*, from *phalange*, phalanx, from Lat. *phalanx*, from Gk. φάλαγξ, line of battle, rank of soldiers, round piece of wood, joint between the fingers and toes). Any of the marsupials of the family Phalangeridae, which are characterized preëminently by having five fingers and toes, the second and third bound together. The thumb is opposable and nailless. The tail is nearly always long and prehensile. The family is divisible into four sections and includes a considerable variety of form. Thus, the true or typical phalangers include the various species of cuscus and various largish species, some arboreal and some terrestrial, besides the petaurists, or flying phalangers (q.v.; also TAGUAN), and the dormouse phalangers of the genus *Dromicia*. An-

other group contains the koala (q.v.), a third the wombat (q.v.), a fourth the aberrant little *Tarsipes* of Western Australia, which is only 7 inches long and uses its long, slender tongue to extract honey from flowers, as well as to catch the small insects which constitute most of its food. The phalangers are united with the kangaroos by descent, and are now separated from them only by the musk kangaroo (*Hypsoprymnodon*).

PHALANX (Lat. *phalanx*, from Gk. φάλαγξ, line of battle, row of soldiers, round piece of wood). The ancient Greek name for the heavy infantry in line of battle. The heavy-armed hoplites were only of service when stationed in a long straight line in close order. In the Homeric poems there are only shadowy traces of a regular line of battle, and the development of the typical Greek formation seems to have been largely the work of the Spartans during their struggles for supremacy in the Peloponnesus. As the principle of formation was the desire to present an equal line to the enemy, the depth and formation depended on circumstances. The usual depth seems to have been eight men, but Miltiades at Marathon weakened his centre in order to extend his line. (For an interesting explanation, somewhat different, of this manœuvre, consult Macan's *Herodotus*, referred to under MARATHON.) At Delium the Theban column was 25 deep. It is not until the fourth century B.C. that we find troops other than the hoplites of practical importance in deciding the Greek battles. During that century the improved equipment of the peltasts, or light-armed troops, made them able to meet the phalanx, if able to choose their ground and avoid the direct attack. Epaminondas gave a new direction to the art of war by replacing the old attack along the whole line with the decisive onset of one wing, drawn up in a heavy column (at Leuctra 50 deep), while the rest of the line in ordinary depth served to check the enemy. Philip of Macedon learned his military science at Thebes, and reorganized his army by the introduction of a regular infantry besides the hereditary cavalry of the nobles. These soldiers were armed with a small shield about 18 inches in diameter, corselets, and long spears, and fought in closer order than was usual among the Greeks. This phalanx seems to have been a mobile body, but probably Philip, and certainly Alexander, relied rather on the heavy cavalry as the offensive force, and used the phalanx to hold the main line of the enemy in check, while the cavalry crushed his wing or turned his flank. The phalanx of Alexander seems to have had pikes of different lengths, the longest being about 17 feet and of course requiring the use of both hands. Though intended to fight in line as a single mass, it was also capable of breaking into small tactical units able to manœuvre separately if the nature of the ground or the development of the battle made it desirable. The successors of Alexander gradually changed his fundamental principles and depended again upon the phalanx to decide the day. This led to even closer massing of men and increase of the length of the lances, till the mass became irresistible if unbroken, but unwieldy and utterly helpless if broken by uneven ground, as was proved in many a battle against the Roman legions. This later phalanx was regularly drawn up 16 men deep and either about 3 feet apart, body included, or only about 18 inches with shields touching, a formation

PHALANGERS



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1. WOMBAT (*Phascolomys Mitchellii*).
2. FLYING SQUIRREL PHALANGER (*Petaurus sclureus*).
3. LONG-SNOUTED PHALANGER (*Tarsipes rostratus*).
4. KOALA (*Phascolarctos cinereus*).

5. CUSCUS (*Phalanger maculatus*).
6. COMMON DASYURE (*Dasyurus viverrinus*).
7. BANDED ANT-EATER (*Myrmecobius fasciatus*).
8. TASMANIAN WOLF (*Thylacinus cynocephalus*).

which made any turning on the part of individuals impossible. The lances were about 20 feet long, and those of the first five ranks projected in front, the others held their spears over the shoulders of their comrades, ready to drop them if occasion arose. Consult: Droysen, "Griechische Kriegsalterthümer," in Hermann, *Lehrbuch der griechischen Antiquitäten* (Freiburg, 1888); Lammert, *Polybios und die römische Taktik* (Leipzig, 1889); Bauer, in Müller's *Handbuch der klassischen Altertumswissenschaft*, vol. iv (Munich, 1893); Hans Delbrück, *Geschichte der Kriegskunst im Rahmen der politischen Geschichte* (Berlin, 1900).

PHALANX. See INFANTRY.

PHALARIS (Lat., from Gk. Φάλαρις). A tyrant of Agrigentum in Sicily, whose rule lasted from about 570 to 549 B.C., when he was killed in a popular revolt. (Cicero, *De Officiis*, ii, 26.) He maintained himself by mercenaries, and chiefly by stratagem extended his power on all sides. The tradition, at least as old as Pindar, *Pythian Odes*, i, 185, that he gratified his savage nature by roasting persons alive in a brazen bull, has made him the universal type of the cruel tyrant. In later times, however, Phalaris was represented as a humane man and as patron of philosophy and literature. A collection of letters which bears his name represents him thus as a kindly and cultivated prince; but Bentley in his famous *Dissertation* (first published in 1690) showed that these are forgeries of the Christian era. Consult E. A. Freeman, *History of Sicily*, vol. ii (Oxford, 1891). See BENTLEY, RICHARD.

PHALARIS. See CANARY GRASS.

PHALAROPE (from Gk. φαλαρίς, *phalaris*, root + πούς, *pous*, foot). A sandpiper-like shore bird of the family Phalaropodidae, having lobate feet and a rather long bill, which is slender, weak, and straight. Phalaropes differ from sandpipers, however, in that they spend the greater part of their time in swimming on the sea, where they seek mollusks and other small marine animals for their food. They are very fearless of man and are said to be easily tamable, but the flesh is only and unpalatable. The phalaropes differ from most other birds in the remarkable relative condition of the two sexes. The females are not only larger and more brightly colored, but they do the courting, and after they have secured a mate and laid their three or four eggs they leave the male to do the incubating. Three species only are known, all inhabitants of the Northern Hemisphere and two circumpolar. Each is now made the type of its own genus. The northern phalarope (*Lobipes lobatus*) has the membrane of the toes scalloped and the bill very slender. It breeds in the Arctic regions and migrates southward on the approach of winter. The nest is a shallow depression in the ground lined with grass and moss. The eggs are olive gray or buffy white, heavily blotched with chocolate brown. Its entire length is rather less than 8 inches. The tail is short. It is a beautiful bird and remarkable for the great difference of its summer and winter plumage, the prevailing tint in winter being a delicate gray, while in summer the upper parts exhibit a fine mixture of slate gray and buff, sides and front of neck rufous, and the breast and under parts are white. The red phalarope (*Phalaropus fulicarius*) is rather larger than the northern phalarope and is, like it, very graceful in form and movements and finely

colored. The membrane of the toes is scalloped, but the bill is stouter, flattened, and has a lancet-shaped tip. The third species is Wilson's phalarope (*Steganopus tricolor*), which is an American bird, found in summer north to the Saskatchewan and in winter south to Brazil and Patagonia. It is rare in the East, but abundant in the Mississippi valley. It is the largest of the three species, being 9 inches or more in length. The toe membranes are plain and unscalloped. Consult Elliott Coues, *Birds of the Northwest* (Washington, 1874), and Turner, *Contributions to the Natural History of Alaska* (Washington, 1886). See Plate of Eggs or WATER AND GAME BIRDS.

PHALÆRUM. One of the harbors of Athens (q.v.). See PIRÆUS.

PHALLOICISM, or **PHALLISM** (from *phallic*, from Gk. φαλλικός, *phallikos*, relating to the male organ, from φαλλός, *phallos*, male organ). The worship of the generative power, as expressed most strongly by adoration of the male organ. As a cult phallicism is typical of the Oriental races, especially Semitic and Dravidian. In Europe its strongest expression is found in Greece, which was under Semitic influence, but as a phase of other worship rather than as a special cult it is native to many savage tribes of America and Asia. Under a corresponding name, *linga* worship, phallicism is still practiced by the natives of India. There are two forms of phallicism. The lower, and probably earlier, form is found when the phallos itself is worshiped as divine or is regarded as emblematic of sexual passion alone. Ordinarily in this form the phallic emblem is the mark of devotion to some deity of lust, who is not necessarily a male divinity. On the contrary, the female deity is more usual and sometimes older than the male. In the latter case we have reverence paid to the divine mothers, or female forms, of India; to the date palm, mother goddess in Arabia, etc.; in the former we find the worship of Dionysus in Greece and Siva in India. In this first form of phallicism there is no notion, or only a very vague notion, of affinity between sexual instinct and the creative power of nature. Among savages the rite in this form is scarcely more than a frankly brutal indulgence of passion; in a civilized community, where excess is frowned upon by a more refined sentiment, the indulgence tends to become secret, as in the Tantric worship of India. This Hindu phallicism, with its conventional admixture of philosophy, represents the conditions which obtained in Greece when orgies were veiled as Orphic mysteries.

In the second form the phallos serves merely as a symbol of that mysterious force which in spring renews vegetable life and awakens to fresh energy all living things, and phallicism thus refined becomes the worship of a great divine unifying and creative power. Such phallicism as this may be the religion of ascetics, like the Lingaites of India, and in this case the phallic emblem is usually twofold, as the deity is regarded as androgynous. But the two emblems, no longer realistic, are merely conventionalized shapes, which are placed in the temples of the male-female god Siva. Such was probably the phallicism of the higher minds in Greece, and to them the Orphic mysteries were a philosophical reinterpretation of the naïve form of grossly material phallicism which alone appealed to the vulgar.

Phallicism is not necessarily primitive, al-

though found in very savage communities. Among the Central Australians, e.g., there are erotic dances, but no trace of phallic worship. Finally it is to be observed that many supposed phallic survivals, such as the *swastikas* (q.v.) and upright stones, may have in reality nothing to do with phallic worship. Phallicism, however, lies at the base of various savage rites in many parts of the world, Asia, Africa, and America, and was often connected, as among the Aztecs, with higher forms of nature worship. Consult: James Fergusson, *Rude Stone Monuments* (London, 1872); G. A. Barton, *Sketch of Semitic Origins, Social and Religious* (New York, 1902); E. B. Tylor, *Primitive Culture* (4th ed., 2 vols., ib., 1903); Clifford Howard, *Sex Worship: An Exposition of the Phallic Origin of Religion* (4th ed., Chicago, 1902); Sha Rocco, *Masculine Cross and Ancient Sex Worship* (ib., 1914). See HINOUISM; LINGA.

PHALLUS. A genus of the Basidiomycetes (q.v.) which includes the so-called stinkhorns. The spore-producing body is a stout hollow stalk, bearing at its summit a caplike structure containing embedded spores. The exposed cap deliquesces into a slimy, dripping mass, with the odor of carrion, which attracts carrion flies, by whose agency the embedded spores are dispersed.

PHANARIOTS. See FANARIOTS.

PHANEROGAMS (from Gk. *phainós, phaneros*, evident + *gámos, gamos*, marriage). An old name of spermatophytes (q.v.), popularly called flowering plants. The name has often been modified to phénogams or phenogams. The name means "evident sexual reproduction," so that the term "flowering plants" is not a translation. The contrasting term is "cryptogams" (q.v.), which means "hidden sexual reproduction." The facts have contradicted the terms, for in cryptogams sexual reproduction is very evident, while in phanerogams it is concealed from ordinary observation.

PHAN'EROGLOS/SA, (Neo-Lat., from Gk. *phainós, phaneros*, evident + *γλῶσσα, glōssa*, tongue). A suborder of the Anura (q.v.), containing those frogs and toads which possess a tongue which has the shape of a round disk adherent by nearly the whole of its base and is not protrusible. This group includes the great majority of the frogs and toads of the world. Consult Hans Gadow, *Amphibia and Reptiles* (London, 1901).

PHAN'OCLES (Lat., from Gk. *φανοκλῆς, Phanoklēs*). A Greek elegiac poet of the close of the fourth century B.C. Of his life we know nothing. His poems deal with the loves of the gods for beautiful boys; the tragic vengeance in each case seems to have been particularly stressed. Apart from some merely verbal fragments, there remains of this series only one considerable piece from a poem on Orpheus's admiration for Calais, and the consequent slaying of Calais by the Thracian women (see ORPHEUS), which shows much beauty of diction and versification. It is edited in Bergk's *Anthologia Lyrica*.

PHARAOH, fā'rō or fā'rā-ō (Heb. *Phar'ōh*, Gk. *Φαραώ, Pharaō*). The Hebrew form of the Egyptian *Per'o*, used in the Bible as the general name or title of the kings of Egypt. From motives of reverence, the Egyptians avoided using the name of their sovereign and usually substituted for it some such expression as "the good god," "Horus the lord of the palace," "his

Majesty," "the King," or, especially under the New Empire, the indefinite pronoun "one." A very old designation of this nature was *Per'o*, great house (i.e., the palace). It occurs as early as the fourth dynasty, was used with special frequency in the vernacular of the New Empire, and finally, at quite a late period, became the common popular designation of the Egyptian monarchs. It is preserved in the Coptic *perro* (the King), where the *p* is mistaken for the definite article. Josephus (*Antiq.*, viii, 6, 2) correctly explains Pharaoh as meaning "King," and as late as the fourth century A.D. Horapollo seems to have known that "great house" was a synonym of "King." Consult G. M. Ebers, *Aegypten und die Bücher Moses* (Leipzig, 1868), and Cheyne and Black, *Encyclopædia Biblica*, vol. iii (London, 1902).

PHARAOH'S HEN, or PHARAOH'S CHICKEN. The small Egyptian vulture (*Neophron percnopterus*), so called because of its frequent appearance in the ancient hieroglyphs.

PHARAOH'S RAT. The Egyptian mongoose (*Herpestes ichneumon*).

PHARAOH'S SERPENTS. See SULPHOCYANIC ACID.

PHARAOH. See FARO.

PHARISEES (Gk. *Φαρισαῖοι, Pharisaioi*, from Aram. *perishaya*, pl. *perishin*, Heb. *perūshim*, the set apart, separatists, from *pārash*, to separate). A Jewish religious party. The Pharisees first emerged as a definite party when the success of the Maccabean revolt led to the foundation of a secular state, at the head of which John Hyrcanus (high priest, 135-105 B.C.) reigned as a secular prince, making alliances with other Powers. Opposition to this policy, along the line of the old spirit of separation from all things non-Jewish (see GENTILES), crystallized in the party of the Pharisees. They were essentially a religious party and used political methods only when they could not otherwise attain their ends. Their distinctive doctrines were: 1. Separation from all intercourse in common life with the mass of the people, whom they designated as the *'am hā' āres* (people of the land). This term did not include, as it had originally done, the heathen inhabitants of the land, from whom Jehovah was supposed to have commanded the Israelites to keep apart for fear of contamination (cf. Ezra ix. 1; Neh. x. 28-31); it was used by the Pharisees to designate even their orthodox fellow countrymen who were less scrupulous than themselves in the interpretation and observance of the law. Since absolute separation was impossible, they drew up elaborate rules to govern their intercourse with the mass of their fellow countrymen. They would not buy or sell in exchange with an *'am hā' āres*, though they worshiped with their countrymen in the temple and synagogue (cf. Luke xviii, 9-14). 2. Less distinctive, but held with equal intensity, was their doctrine of the strict interpretation and rigid observance of the law as a necessity to righteousness. They insisted upon both the written law (the *Torah*) and also the traditions of the elders, or the oral law. (the *Halacha*). Indeed, they made the tradition of more weight than the law (Mark vii. 8 et seq.). Their legal prescriptions were extended to the minute details of the ablution of hands and vessels, to tithes, fasts, and Sabbath observance. According to their teaching righteousness was the product of legal observance. 3. They cherished the political ideal of a restora-

tion of the kingdom of Israel, which they expected to be accomplished through the interposition of a divine act; preparation for this consummation they believed was best achieved through a strict carrying out of the law. Foreign domination they regarded as a punishment of God for the sins of the people, though they would submit to any rule, even that of a foreign conqueror, if it would establish the supreme observance of the law. (See ZEALOT.) 4. Their other doctrines, regarding the immortality of the soul, providence, and human freedom, were less peculiar and held in common with other Jews. See SADDUCEES.

The Pharisees are most familiar through their relation to Jesus of Nazareth. In spite of the fact that they cherished a strong national Messianic hope and were the producers of the apocalyptic literature which gave such passionate expression to it, they became the bitter opponents of Jesus, and that early in his ministry, developing their hostility until they compassed his death. The grounds of their enmity were many. He and his disciples mingled freely with publicans and sinners, thus violating the distinctive Pharisaic doctrine of separation from the 'am hā' āres (cf. Mark ii. 15-17). They were careless about the strict observance of fasts, ablutions, and the Sabbath (cf. Mark ii. 18-22; vii. 1-16; iii. 1-6). The teaching of Jesus concerning the Fatherhood of God was in direct opposition to the letter and spirit of Pharisaic legalism (cf. Matt. vi. vii. 7-11, 18-23; Luke xv. 11-32), while his claim of direct relationship to God was to them blasphemy (cf. John v. 18; x. 33). His interpretation of the *Torah* in the Sermon on the Mount was a repudiation of the Pharisaic principle that righteousness is the result of the strictness with which commandments affecting the external life are observed (cf. Matt. v. 17-47). The Pharisees made the religious relation one of legal compact; Jesus made it one of personal fellowship in the bond of filial trust and obedience. These two systems were utterly contradictory. This is evident in the incident of the paralytic (Mark ii. 7), where Jesus grants forgiveness of sins without any ceremonial conditions. The representatives of the one could not endure the teacher of the other. Hence the Pharisees were the most active in putting Jesus to death. At the same time it must be remembered that some of the ideas with which the Pharisees had indoctrinated the people did not a little in preparing the way for Jesus' own teaching. The hope of a Messianic reign, the belief in a resurrection and an immortal existence, the assurance of a divine providence over life and a divine control of history, even the insistence upon individual righteousness—external and material as their view point was—had made the people ready, as otherwise they would not have been, for the spiritual interpretation of these truths which was given in Jesus' message. After the destruction of Jerusalem under Titus (70 A.D.) the Pharisees survived as a party; their leading rabbis formed a body which regarded itself as the continuation of the ancient Sanhedrin; this group persisted and preserved Judaism of the stricter sort after the theocracy was really overthrown.

Bibliography. Consult the histories of the Jews by Ewald, Grätz, Wellhausen, and the lives of Jesus; Abraham Geiger, *Sadduceer und Phariseer* (Breslau, 1863); Julius Wellhausen, *Die Phariseer und Sadduceer* (Greifswald,

1874); J. Cohen, *Les Pharisiens* (Paris, 1877); A. B. Bruce, *The Kingdom of God* (Edinburgh, 1889); Emil Schürer, *History of the Jewish People in the Time of Jesus Christ* (Eng. trans., 5 vols., New York, 1896); C. H. Cornill, *History of the People of Israel*, translated by W. H. Carruth (Chicago, 1898); F. E. C. Gigot, *Outlines of New Testament History* (New York, 1902); Prince, "Scribes and Pharisees," in *Encyclopædia Biblica*, vol. iv (ib., 1903); Scott, in James Hastings (ed.), *Dictionary of Christ and the Gospels*, vol. ii (New York, 1908); William Fairweather, *The Background of the Gospels* (ib., 1908); H. S. Nash, in James Hastings (ed.), *Dictionary of the Bible* (ib., 1909); Matthews, in *Standard Bible Dictionary* (ib., 1909); R. T. Herford, *Pharisaism: Its Aim and its Method* (ib., 1912).

PHARMACEUTICAL ASSOCIATION, AMERICAN. A scientific society with its headquarters at Baltimore, Md. Its initial meeting was held in New York in 1851. The association was organized in Philadelphia in 1852 and incorporated in Washington, D. C., in 1888. Its objects are to improve the science and art of pharmacy by diffusing scientific knowledge among apothecaries and druggists, to foster pharmaceutical literature, to stimulate discovery and invention, and to encourage home production and manufacture in the several lines of drugs. It has published annual volumes of proceedings since 1851, except for the year 1861.

PHARMACOGNOSY (from Gk. *pharmakon*, *pharmakon*, drug, medicine + *γνώσις*, *gnōsis*, knowledge). See PHARMACOLOGY.

PHARMACOL'OGY (from Gk. *pharmakon*, *pharmakon*, drug, medicine + *λόγος*, *logos*, discourse, science). The science of drugs, their sources, description, nature, preparation, administration, and effects. See also MATERIA MEDICA; PHARMACOPEIA.

PHARMACOPEIA (Neo-Lat., from Gk. *φαρμακοποιία*, *pharmakopoiia*, art of preparing drugs, from *φαρμακοποιός*, *pharmakopoios*, one who prepares drugs, from *φάρμακον*, *pharmakon*, drug, medicine + *ποιεῖν*, *poiein*, to make). A term applied to various works, consisting for the most part of (1) a list of the articles of the materia medica, whether simple or compound, with their characters, and the tests for the determination of their purity, i.e., a condensed manual of pharmacology; and (2) a collection of approved receipts or prescriptions, together with the processes for articles in the materia medica, obtained by chemical operations.

The first pharmacopeia published under authority appears to have been that of the city of Nuremberg in the year 1546, prepared by Valerius Cordus, later professor at Wittenberg, who was staying for a short time at Nuremberg and had made a selection from the works of the most eminent writers on pharmacology. This municipal pharmacopeia was followed in 1564 by those of the cities of Augsburg, in 1565 of Cologne, and in 1576 of Lyons, while the first governmental pharmacopeia published was the one of Brandenburg in 1698. Before this time the books chiefly in use by apothecaries were the treatises of Dioscorides (c.50 A.D.), of Andromachus (c.75 A.D.), Rhazes's (died 932) *Continens*, Avicenna's (born 980) *Canon Medicinæ*; *De Medicinis Lavativis* and *Antidotarium* of Johannes Damascenus or Mezuë (died 1015), *Practica* of Bartholomæus (c.1050), *Ars medendi* of Copto (c.1100), the *Simples* of Serapion the

Younger (c.1225), *Antidotarium* (called *magnum*) of Nicolaus Alexandrinus (thirteenth century), and, most important of all, the *Antidotarium* (called *parvum*) of Nicolaus Praepositus of Salerno; while the so-called pharmacopœia of Gotha by Everhard van Wampen (1325) was an abridged edition of Bartholomæus' *Practica*. The *Compendium Aromatariorum* (1447) of Saladin of Ascalon was also used. Later on there appeared the pharmacopœias of Foesius (1561), Christopher Wirsung (1577), Wecker (1581), *La Pharmacopée* of Brice Bauderon (1588), and of Jean de Renou (1624), etc.

The first edition of the *Pharmacopœia* (or, more correctly speaking, of the pharmacopœia of the London College of Physicians) appeared in 1618 and was chiefly founded on the works of Mezue and Nicolaus of Salerno; Nicholas Culpeper translated the Latin version into English in 1649. Successive editions appeared in 1627, 1635, 1650, 1697, 1721, 1746, 1787, 1809, 1824, 1836, and 1851 and form an important contribution to the history of the progress of pharmacy and therapeutics during the last two centuries and a half.

The Edinburgh pharmacopœia is more modern than the London, the first edition having appeared in 1722, while the Dublin pharmacopœia does not date farther back than 1807. The latest editions of these works appeared in the years 1841 and 1850 respectively.

Until the Medical Act passed in 1858, the right of publishing the pharmacopœia for England, Scotland, and Ireland was vested in the colleges of physicians of London, Edinburgh, and Dublin respectively; and as these three pharmacopœias contained many important preparations, similar in name but totally different in strength, dangerous complications arose from a London prescription being made up in Edinburgh or Dublin, or vice versa. By that Act it was ordained that the general (medical) council should cause to be published a *British Pharmacopœia* which should take the place through Great Britain and Ireland of the three above-named pharmacopœias. The first edition in 1864 was followed by others in 1867, 1874, 1885, a supplement in 1890, and the latest in 1914.

In the United States the first pharmacopœia was published in Philadelphia in 1778 for the use of a portion of the American army. Another was published in 1805 by the Massachusetts Medical Society. The New York Hospital issued one for its own use in 1815; later editions, like those of similar institutions, being known as the *Formulary* and consisting of classified collections of prescriptions. The Medical Society of the County of New York in 1818 took measures for holding a convention of delegates from various State medical societies and medical colleges, which met at Washington, Jan. 1, 1820. The action taken then resulted in the appearance the same year of the first *Pharmacopœia* in the United States of America, a volume of 272 pages in Latin and English. Since the edition of 1840 the Latin has been omitted. The convention made provisions for the holding of other conventions for revision every 10 years. The convention of 1860 received delegates from the army and navy and from various colleges of pharmacy and pharmaceutical societies. But this pharmacopœia was not published by authority of the government, and its requirements were enforced by law only in certain States, until in 1907, under the provision of the National Food and

Drugs Act, it became a legal standard. Following the convention held at Washington in 1910, the ninth revised edition was to be published in 1915.

Almost every civilized country of importance has its national pharmacopœia published in its own language, the use of Latin having entirely disappeared. There exist at present about 30 pharmacopœias, of different size and contents, so that only about 150 remedies appear in all of them. Best known among these pharmacopœias are the Austrian (abbrev., P. Austr.) 1744, 1st ed. in its present form, 1774; the British (B. P.) 1627, 1st ed. 1864; the French, *Code de médicamentarius* (Codex), 1638, 1st ed. 1818; the German (P. G.), 1st ed. 1872, based principally upon the Prussian, 1698, 1st ed. 1799; the Swiss (P. Helv.), 1st ed. 1870; and the *United States Pharmacopœia* (U. S. P.), 1st ed. 1820.

It may be proper here to make the distinction between a pharmacopœia and a dispensatory. These terms have been used indiscriminately, but there is a distinction among pharmacists. A pharmacopœia is strictly a collection of recipes or instructions for making various medicinal compounds, or simple preparations, which are also made under the authority of a college or body of medical men, and are termed "official" or "pharmacopœial." A dispensatory is a book which also treats of the preparation of medicines, but it moreover contains the natural as well as the medical history of the various medicinal substances. A dispensatory, in addition to official preparations, may contain many others and be published without official authority. A dispensatory is also to a greater or less extent a treatise on *materia medica* (q.v.) or pharmacology, a branch of medical science which treats of the knowledge and action of medicines, and may either treat of the action of individual medicines or embrace the whole range of the pharmacopœia and occupy itself with the action of every article, simple or compound, either upon a healthy or a diseased subject; that is to say, it may consider the physiological as well as the therapeutic action of medicines, therapeutics (q.v.) being that branch of the science which treats of the action of drugs as *medicines* strictly speaking, or their action in disease; for this is often very different from their action on the healthy body, or their physiological action. A dispensatory is generally a combination of a pharmacopœia, a *materia medica*, and a treatise on pharmacology and on therapeutics, as far as the latter is not included in *materia medica*. The first edition of the *United States Dispensatory* was issued in 1831. It has since that time passed through many revisions and has become double its original size, till at the present time it is really an encyclopædia of therapeutics, pharmacy, and *materia medica*. Several other excellent pharmacopœias and dispensatories have been published, the *National Dispensatory* and the *American Dispensatory* being the most prominent. Though valuable, they do not occupy the official position that is filled by the pharmacopœia. New preparations are, of course, continually added to the pharmacopœias.

Consult: Bruno Hirsch, *Universal Pharmacopœie* (2d ed., Göttingen, 1902); J. Berendes, *Das Apothekewesen* (Stuttgart, 1907); Lucas and Stevens, *The Book of Pharmacopœias* (Philadelphia, 1915).

PHARMACY (OF. *farmacie*, Fr. *pharmacie*, from Gk. *pharmakela*, *pharmakeia*, use of drugs,

from *φάρμακον*, *pharmakon*, drug, medicine). That department of *materia medica* (q.v.) which treats of the collection, preparation, preservation, and dispensing of medicines. It is synonymous with pharmaceutical chemistry. Also a place where drugs are prepared, dispensed, and sold; a drugstore or an apothecary's shop.

PHARNABAZUS (Lat., from Gk. *Φαρνάβαζος*, from OPers. **Farnābazu*, having an arm of glory). A Persian, son of Pharnaces, whom he succeeded, in the reign of Darius II, as satrap of the region Dascylitis, which embraced the coast lands in northwestern Asia Minor. In 413 B.C. he espoused the cause of the Spartans, with whom he acted in concert for several years, endeavoring to drive the Athenians from the region of the Hellespont. In 408, however, changing his policy, he made a covenant of friendship and hospitality with Alcibiades and accepted terms of accommodation from the Athenians. In 396 he defeated an invading Spartan force under Agesilaus, but in the next year was himself defeated by that general. Soon after, Conon came to his assistance from Athens, and the two sailed through the Ægean Sea, driving out the Lacedæmonians from the seaport towns. Pharnabazus' final effort was with the Athenian Iphicrates in Egypt in 377 and the following years. The expedition proved unsuccessful.

PHARNACES (Gk. *Φαρνάκης*). 1. A king of Pontus (190-c.156 B.C.), son of Mithridates IV. He waged war unsuccessfully with Eumenes, King of Pergamum (q.v.), and with Ariarathes, King of Cappadocia. 2. Son of Mithridates VI the Great (q.v.), ruler of the Kingdom of Bosphorus (q.v.). In 63 B.C. he compelled his father to put an end to his life. Afterward he submitted to Pompey, who granted him the Kingdom of Bosphorus and called him ally and friend of the Roman people. In the war between Cæsar and Pompey he declared against Cæsar, but was defeated by Cæsar, near Zela in 47 B.C. The case with which the victory was won called forth Cæsar's famous message, *Veni, vidi, vici* (I came, I saw, I conquered). In 47 Pharnaces was slain by his own general, Asander, who hoped for his throne. See CRIMEA, *History*.

PHAROS (Lat., from Gk. *Φάρος*). A rocky island off the west extremity of the Egyptian coast, opposite the town of Rakotis. When Alexander chose the site of Alexandria, he connected the island with the mainland by the Heptastadium, or Seven-Furlong Mole. This made it possible to build two harbors, and on the eastern extremity of the island, at the entrance to the great harbor, Ptolemy I began the erection of a great lighthouse, which was finished under his son, Ptolemy Philadelphus, about 282 B.C. The architect was Sostratus of Onidus, and the work was reckoned among the wonders of the world. It was a lofty tower with a square base measuring about 100 feet on a side, and the light was furnished by a beacon fire on the summit. The statements that it was 400 feet high and that the light was visible for 60 miles at sea are certainly exaggerations. After this lighthouse, from the name of the island also called the Pharos, had stood for nearly 1600 years one side was thrown down by an earthquake on Aug. 7, 1303, and in 1346 it was a complete ruin. In 1478 the foundations were used for the fort Kaft Bai; the side of the great central tower of this fort has the same length as that given for the side of the old Pharos. The name Pharos was borne by at least 20

other lighthouses in the ancient classical world. Consult Von Holbach, in *Kaiserlich Deutsches Archäologisches Institut, Mittheilungen: Athenische Abtheilung*, vol. xxxiv (1909), and the article "Leuchttürme," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

PHARSA/TA, or **PHERSA/TA**. The modern name of the ancient Pharsalus (q.v.).

PHARSA/TIA. An epic poem in 10 books by Lucan, narrating the struggle between Cæsar and Pompeius. The hero is Cato.

PHARSA/TUS (Lat., from Gk. *Φάρσαλος*), now Pharsala. A Greek city of southern Thessaly, on the river Enipeus, the chief town of the District of Pharsalia. It does not appear in history until the fifth century B.C. and seems to have been one of the prosperous cities of Thessaly. In the fourth century B.C. it was the home of Daochus, who was one of the chief adherents of Philip of Macedon. It is best known from the battle of Pharsalus, fought near the city on Aug. 9, 48 B.C., between Cæsar and Pompeius. Pompeius had about 47,000 legionaries, 7000 cavalry, and a great number of light-armed auxiliaries. Cæsar had 22,000 legionaries and 1000 German and Gallic cavalry. The battle, which commenced with an attack by Pompeius' cavalry on Cæsar's right wing, ended in the turning of Pompeius' left and the destruction of his army. About 15,000 fell, and the remainder surrendered on the following day. Pharsala was one of the positions occupied by the Greeks in the disastrous war against Turkey in 1897 and after the rout of the Greeks was entered by the Turks on May 6. (Consult K. Baedeker, *Greece*, 4th Eng. ed., Leipzig, 1909.) The struggle between Cæsar and Pompeius is the theme of the *Pharsalia*, the epic poem by Lucan (q.v.).

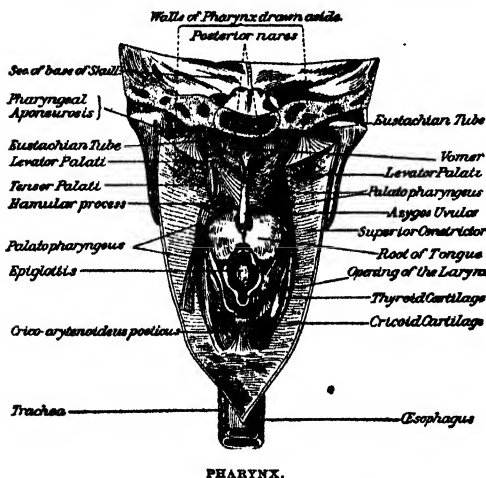
PHARYNGITIS (Neo-Lat., from Gk. *φάρυγξ*, *pharynx*, throat, pharynx). A disease of the mucous membrane lining the pharynx, accompanied by inflammation. It is generally described as of one of two types: (1) catarrhal, (2) follicular. Catarrhal pharyngitis is the ordinary "sore throat." It is characterized by swelling and relaxation of the mucous membrane, with redness and tenderness of its surface, and occasionally ulceration with bleeding (gangrenous pharyngitis). Occasionally there is a chill, followed by fever at the beginning of the attack. The follicular variety is characterized by a pebbled surface, the elevations corresponding to the situation of the follicles in the membrane. Either variety may be preceded by a stage during which the mucous membrane is dry and the surface dull and pale. There is also a chronic dry pharyngitis. The affection is sometimes caused by inhaling irritating vapors, including tobacco smoke, or by exposure. It is often rheumatic in origin, and intestinal autointoxication is a predisposing cause. Acute pharyngitis is best treated locally by a mild, alkaline gargle and internally with aconite, phenacetin, aspirin, and salol to relieve pain and reduce fever. Purgatives and diuretics are used when indicated. Chronic pharyngitis requires first the removal of the underlying cause, e.g., autointoxication, rheumatism, smoking; and locally cleansing and astringent washes. Inflammation of the pharyngeal soft parts around the tonsil, or peritonsillitis, is described under QUINSEY (q.v.).

PHARYNGOGNATHI (Neo-Lat. nom. pl., from Gk. *φάρυγξ*, *pharynx*, throat + *γνάθος*, *gnathos*, jaw). A suborder of acanthopterous

fishes, having the lower pharyngeals fully united. It includes the Labridæ, Scaridæ, and allies. This group has aroused diversity of opinion among ichthyologists. Consult Jordan and Evermann, *Fishes of North America* (Washington, 1896).

PHARYNX (Neo-Lat., from Gk. *pharyx*, *pharynx*, throat, pharynx; connected with *pharyx*, *pharax*, cleft, *pharān*, *pharan*, to plow). The name of the combined portion of the respiratory and alimentary tracts which lies behind the nose and mouth above and in front, and the larynx and œsophagus below. It is a musculo-membranous sac situated in front of the cervical portion of the vertebral column and extending from the base of the occiput to the level of the fifth cervical vertebra, where it becomes continuous with the œsophagus (q.v.). Its length is about $4\frac{1}{2}$ inches; it is broader in its transverse than in its anteroposterior diameter, and its narrowest point is at its termination in the œsophagus. Seven openings communicate with it, viz., the two posterior nares or nostrils, at the upper and front part of the pharynx; the two Eustachian tubes, opening on the outer margins of the preceding orifices; the mouth; the larynx; and the œsophagus. Its anterior limit at the level of the mouth is marked on each side, by two musculomembranous folds, between which lie the tonsils.

The pharynx is composed of an external muscular coat; a middle fibrous coat called the pharyngeal aponeurosis, thick above where the muscular coat is absent, and gradually thinning as it descends; and a mucous coat, continuous with the mucous membrane of the mouth and nostrils. The muscular coat requires special notice. It is composed of a superior, middle, and inferior constrictor muscle on either side, together with two less important muscles, termed the stylopharyngeus and palatopharyngeus



PHARYNX.

muscles. When the food, after being sufficiently masticated and mixed with saliva, is thrown, by the action of the tongue, into the pharynx, the latter is drawn upward and dilated in different directions; the elevator muscles (the stylopharyngeus and palatopharyngeus) then relax, and the pharynx descends; and as soon as the morsel is fairly within the sphere of action of the constrictor muscles, they successively contract upon it and pass it on to the œsophagus.

The pharynx has an influence on voice modulation, especially in the production of the higher notes.

The pharynx is subject to various circulatory disturbances, to acute and chronic inflammations, diphtheria, ulceration, suppuration, and abscess. See also PALATE.

PHASE INDICATOR. See SYNCHRONIZER.

PHASE RULE. A principle of physical chemistry discovered by J. Willard Gibbs (q.v.). By "phase" is meant each of the homogeneous parts of such a system as water with ice floating on its surface; liquid water is said to form one phase of the system, ice another phase. The water vapor over the half-liquid, half-solid water is recognized as a separate phase.

No system can have more than one vapor phase, because all vapors mix to form homogeneous media. Liquids, on the other hand, frequently refuse to mix (e.g., oil and water), and so a system may have two or even three distinct liquid phases, each homogeneous liquid layer constituting a separate phase. Solids quite usually refuse to mix homogeneously, so that an apparently mixed powder really consists of distinct solid phases. A system may have a considerable number of solid phases.

Gibbs's Phase Rule correlates the number of phases that a system may have with the number of its "independent components." In a system of which the ingredients do not react chemically, the number of independent components is simply the number of substances present. If a single chemical reaction (of reasonable speed) is possible, the number of independent components is the number of substances present less one; if two chemical reactions are possible, the number of independent components equals the number of substances present less two; and so forth.

In its simplest form the phase rule affirms that the number of phases can never exceed the number of independent components by more than two. In pure water we have one single substance, and of course no reaction; hence the number of independent components is one. The phase rule therefore affirms that the number of water phases that can at any time exist together in stable equilibrium cannot possibly exceed three. We may have (at the freezing point) liquid water, ice, and water vapor together. But we could not possibly obtain two different kinds of ice (see ICE) and water and water vapor all together as a stable mass; that would make four phases, a number exceeding by three the number of independent components. If we are to get two forms of ice in equilibrium with liquid water, we must eliminate the vapor phase (by working under pressure). Consult: W. D. Bancroft, *The Phase Rule* (Ithaca, 1897); H. W. B. Roozeboom, *Die heterogenen Gleichgewichte vom Standpunkte der Phasentheorie* (Brunswick, 1901 et seq.); Alexander Findlay, *The Phase Rule* (3d ed., New York, 1911).

PHASES (ML. nom. pl., from Gk. *phásis*, *phasis*, appearance, from *pháō*, *phaein*, Skt. *bhā*, to shine). The different luminous appearances presented by the moon and several of the planets, sometimes the whole, a part, or none, of the luminous surface being seen from the earth. (For the various phases of the moon and the seasons for them, see MOON.) Mercury and Venus present to an observer on the earth similar phases to those of the moon, but require, instead of a month, periods of 116 and 584 days,

respectively, to pass through a complete series of phases. Since Mars has an orbit exterior to that of the earth, it cannot pass between it and the sun. Consequently we can never observe a crescent phase of this planet. But when in quadrature (q.v.) it is visibly gibbous, like the moon when about four days from full. The other planets show no observable phases on account of their great distances from the earth.

PHA'SIS. The ancient name of a river in Transcaucasia, now called the Rion (q.v.).

PHAT'AGIN. See MANIS.

PHAYER, THOMAS. See PHAER, THOMAS.

PHAZANIA. See FEZZAN.

PHE'AL. See JACKAL.

PHEASANT, fēz'ant (AF. *fesant*, *fesaunt*, OF., Fr. *faisan*, from Lat. *phasianus*, from Gk. *φασιανός*, *phasiant*, *φασιανός*, relating to the Phasis, from *φάσις*, *Phasis*, the name of a river in Colchis, where the pheasant has always abounded). A group of large gallinaceous birds, usually long-tailed and with brilliant coloring, of the family Phasianidae and especially of the subfamily Phasianinae. The skin around the eyes and sometimes the cheeks and specialized wattles are bare of feathers, the wings are broad and rounded, and the tail is usually elongated. Beebe in his recent study of this group has separated the pheasants from the Old World quail, partridges, and francolins by the difference in the sequence of molt of the tail feathers. This places the blood pheasants or partridges and the tragopans in the *Perdixinae*. Phasianinae proper contains 12 genera. The most brilliantly iridescent of all the groups are the Impeyans or monauls (*Lophophorus*) of the Himalaya, the bright coloring, as is usual among the pheasants, being confined to the males. The eared pheasants (*Crossoptilon*) of central and northern China number three species. The sexes are alike, and the tail feathers are long and loose-webbed and for centuries have been used to decorate the official hats of mandarins. Four genera show a rather close relationship, although connected by only the most superficial of characters, such as the compressed tail and facial wattles. The most important and generalized genus is *Gennæus*, containing the kaleegee and silver pheasants. The former are dark-colored with long flowing crests and are scattered along the base of the Himalaya. In Burma these touch the range of the lineated kaleegee (*Gennæus lineatus*) and the silver pheasants, and along the line of contact many hybrid forms have been shot and mistakenly named as good species. The Chinese silver pheasant (*Gennæus nycthemerus*) ranges across southern China. The upper plumage is white, finely penciled with black, while the lower parts are blue black. In the related tropical genera *Acomus* and *Lophura* the plumage is more brilliant, the fiery metallic red of the lower back giving these birds their name of firebacks, and the facial skin and wattles being red or blue. They live in the dense jungles of southeastern Asia and range from Siam to Borneo. In the latter island occurs the extraordinary white-tailed wattled pheasant (*Lobiophasis bulweri*), the male of which has a great fan-shaped white tail of 32 feathers and three pairs of elongated facial wattles. The female, as usual, is sombre in color, with only 28 tail feathers. Rather isolated are the four species of jungle fowl (q.v.) (*Gallus*), the koklass

pheasants (*Pucrasia*), and the cheer (*Oatreus*). The latter is represented by a single species (*Oatreus walliohi*) and lives in the western Himalaya on rocky heights among scattered deodars at elevations of 4000 feet or over. It has a long dark-brown crest, and the general color is yellowish brown, rufous, and ashy, more or less barred with black.

The name "pheasant" belongs, by etymology and usage, more particularly to the bird now so extensively naturalized in Europe and other parts of the world known as the common or the English pheasant (*Phasianus colchicus*). It is a member of the genus *Phasianus*, which includes about 18 species with numerous subspecies, and which has representatives extending straight across Asia from the Caucasus Mountains to Japan. The reeves and copper pheasants were formerly included in this genus, but without them it is much more homogeneous and typified by the disintegrated feathers of the rump, which have the appearance of hair. The Caucasus or Colchis bird was brought to Great Britain probably by the Romans and is now the standard game bird of many parts of the world, being bred and reared in enormous numbers on great preserves for the annual shooting season. This so-called "common" pheasant varies much in plumage owing to its having been crossed with several closely related forms, especially the ring-necked pheasant of eastern China. The head and neck of the cock are metallic steel blue, reflecting brown, green, and purple tints in different lights; the back and wings show a fine mixture of black, brown, light yellow and coppery red, while the breast and lower parts are golden red, each feather margined with black and reflecting tints of gold and purple. The tail is long, tapering, and barred with black. The cock bird measures about 3 feet in length, of which the tail occupies over 20 inches. The female is smaller, measuring 2 feet over all, and is pale yellowish brown, varied with darker brown, the sides of the neck tinged with vinous and greenish. See Colored Plate of Game Birds, under GROUSE.

The weight of the cocks varies from two and one half to four pounds. Pheasants are polygamous. The nest is placed on the ground, merely a hollow among dead leaves, in which the 10 or 12 olive-brown eggs are laid. On preserves, however, the eggs are taken by the gamekeepers and hatched by hens. Very young pheasants must be carefully supplied with ants, eggs, maggots, etc., and the whole difficulty of rearing them is in their earliest stage. Adult pheasants feed indiscriminately on berries, seeds, roots, young shoots of plants, worms, insects, etc. They roost in trees. The male pheasant takes flight much more readily than the female, which often remains still until the sportsman is almost upon her. The males and females do not associate together except during the breeding season, but small numbers of one sex are often found in company. The "short crow" of the males begins to be heard in March. In England and Scotland pheasant shooting legally begins on October 1 and ends on February 3. The pheasants turned out from the gamekeeper's breeding yard into a preserve are in general supplied with abundance of food during winter and come to the accustomed call as readily as any kind of poultry, so that the sportsmanship of a battue, in which they are

killed by scores or hundreds, is of the lowest kind. The pheasant exhibits a remarkable readiness to hybridize with other gallinaceous birds; a hybrid between it and the common fowl is not infrequent and is called a pero. Hybrids with the black grouse have also occurred. The flesh is excellent for eating. These pheasants have been introduced into the United States, and in many places in Oregon they are so abundant as to have become a nuisance. Other well-known wild forms are the Chinese ring-necked pheasant (*Phasianus torquatus*) and the green Japanese pheasant (*Phasianus versicolor*).

The reeves, Elliot's, copper, mikado, and Burmese bar-tailed pheasants may be grouped in the genus *Symaticus*, owing to the close resemblance of the hens and the lack of any character separating the cocks other than their multitudinous colors and patterns. The reeve (*Symaticus reevesi*) of northern China is a large bird, golden yellow in general coloration, each feather barred with black; the flanks are white with chestnut margins, and the belly is black. The tail is extremely long, the central feathers sometimes measuring over 6 feet. They are whitish, margined with buff and barred with black and chestnut. The mikado pheasant (*Symaticus mikado*) has recently been discovered in Formosa and is of a rich blue black, marked on the wings with small white spots.

Chrysolophus is the group containing the golden and Amherst pheasants. They are gorgeous birds. The former (*Chrysolophus pictus*) has the back metallic green, the underparts scarlet, the rump golden yellow, the crest amber-colored, and a magnificent ruff about the neck, orange red tipped with dark blue. Lady Amherst's pheasant (*Chrysolophus amherstiae*) has the breast metallic green and the belly white, the crest crimson with whitish tips and the nuchal ruff white margined with rich green. The tail of this bird is exceedingly long and graceful. These are hardy birds, living at moderate heights in the mountain forests of central and western China.

Owing to still another difference in tail molt four genera are segregated in the subfamily Argusianinae, inclusive of the peacock pheasants and the argus. The former comprise about a half-dozen species placed in the two genera *Chalcurus* and *Polyplectron*, while the four species of argus also present two distinct groups *Rheinardus* and *Argusianus*. The peacock pheasants are so named from the multitude of metallic ocelli or eyes on the plumage of the tail and upper parts. The true argus are perhaps the most wonderfully patterned birds in the world, the Malayan argus (*Argusianus argus*) being decorated on its greatly elongated secondary wing feathers with spots which resemble delicately tinted balls revolving in ornate sockets. This bird clears a circle in the jungle about 5 yards in diameter, in which it erects its wings and tail and displays before the female. The position assumed in courtship appears on the Plate of PHEASANTS.

Finally, we have the peacocks themselves as the last genus (*Pavo*) and subfamily (Pavoninae) of the pheasants.

Several more or less related birds are called pheasants by colonists and sportsmen in various parts of the world, e.g., the ruffed grouse in the southern United States.

Bibliography. D. G. Elliot, *Monograph of the Phasianidae* (2 vols., London, 1870-72); Hume and Marshall, *Game Birds of India* (Calcutta, 1879); L. H. Stejneger, in *Standard Natural History*, vol. iv (Boston, 1885); Grant, *Hand-Book to Game Birds* (London, 1895); A. H. Evans, *Birds* (ib., 1903); F. H. Knowlton, *Birds of the World* (New York, 1909); J. G. Millais, *The Natural History of British Game Birds* (London, 1909); W. B. Tegetmeier, *Pheasants: Their Natural History and Practical Management* (ib., 1904); C. W. Beebe, *Monograph of the Pheasants* (4 vols., ib., 1915). See CHEER PHEASANT.

PHEASANT, CHINESE SILVER. See KALEEGE **PHEASANT'S-EYE.** See ADONIS, and Plate of ACANTHUS.

PHEASANT SHELL. A gastropod mollusk of the family Turbinidae, of which the shells are much valued for their beauty, suggesting, by their gorgeous metallic tints, the plumage of pheasants; when formerly they were rare in collections, they were sometimes sold for extraordinary prices. They are now comparatively cheap and plentiful, being found in great numbers in Australia.

PHEÈDRE, fâ'dr'. A tragedy in five acts by Racine, first presented at the Hôtel de Bourgogne in 1677. The subject is taken from the *Hippolytus* of Euripides.

PHEGEUS (Lat., from Gk. Φηγεύς). An Arcadian king who gave his daughter in marriage to Alcmaeon (q.v.). The latter gave his wife the peplus and necklace of Harmonia (q.v.), but was slain by the sons of Phegeus when he attempted to recover his gifts in order to give them to his later wife, Calirrhoe. Phegeus in turn was killed by the sons of Alcmaeon.

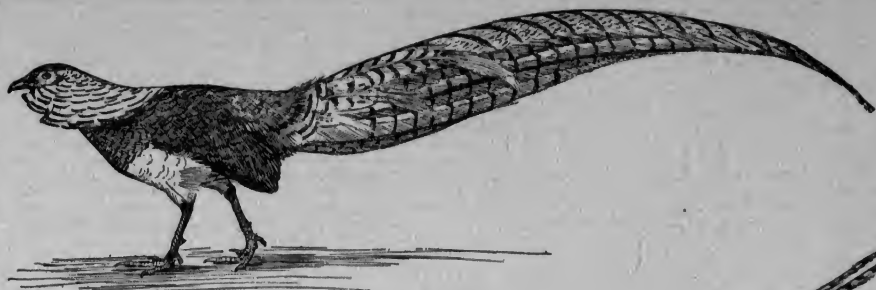
PHEIDIAS. See PHIDIAS.

PHELAN, JAMES DUVAL (1861-). An American lawyer, mayor, and legislator, born in San Francisco. He graduated from St Ignatius College in 1881, studied law at the University of California, and in 1903 was given the degree of Ph.D. by Santa Clara College. While practicing his profession in San Francisco, he became prominent in the Democratic party. Also interested in many civic movements, president of the Mutual Savings Bank, and a director in numerous financial institutions, from 1896 to 1902 he was successful and popular as mayor. In 1900 he was given the complimentary vote of the Democratic minority for the United States Senate. In the same year he was chairman of the charter commission which secured a new reform charter for the city. After the disastrous San Francisco earthquake of 1906 he was one of the most efficient leaders in relief and reconstruction, being chairman of the committees of fifty and of forty for these purposes. In 1913 Phelan was appointed by President Wilson special commissioner to visit European countries and invite their governments to participate in the Panama-Pacific Exposition. In 1914 he was elected by a small plurality to the United States Senate. He is author of numerous articles on city improvement and municipal government.

PHELLODERM (from Gk. φελλός, *phellos*, cork + δέρμα, *derma*, skin). The plant tissue produced internally by the phellogen (q.v.). See HISTOLOGY.

PHELLOGEN (from Gk. φελλός, *phellos*, cork + -γενής, *-genēs*, producing, from γίγνεσθαι,

PHEASANTS



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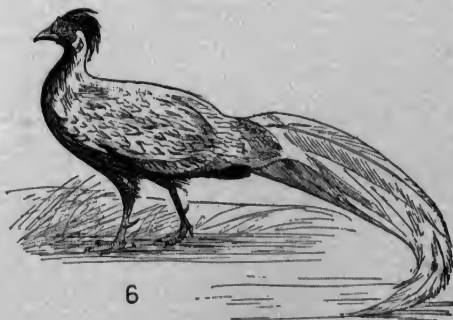
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1. LADY AMHERST'S GOLDEN PHEASANT (*Chrysolophus amherstiae*).
2. COMMON HYBRID ENGLISH PHEASANT (*Phasianus colchicus* + *torquatus*).
3. ARGUS PHEASANT (*Argusianus argus*).
4. YOUNG MALE BORNEAN PHEASANT (*Lobiphasis bulweri*).
5. PEACOCK PHEASANT (*Polyplecton bicalcaratum*).
6. CHINESE SILVER PHEASANT (*Gennæus nyctemerus*).

gignethai, to become), or CORK CAMBIUM. A meristematic layer which usually arises in the primary cortex, giving rise externally to cork tissue and internally to phelloderm (cork cortex). Phellogen, cork, and phelloderm together are known as periderm, which is usually the conspicuous region of bark. Often a phellogen layer gradually ceases its activity, and a new one develops beneath the old. See BARK; CAMBIUM.

PHILO'NION. See COSTUME, ECCLESIASTICAL.

PHELPS, ANSON GREENE (1781-1853). An American merchant and philanthropist, born in Connecticut. He removed to Hartford at the age of 18, and established himself in the saddlery business. In 1815 he removed to New York and engaged as a merchant in tin plate and heavy metals. He acquired a large fortune, partly in real estate, and gave much of his wealth to benevolent purposes. He was president of the New York blind asylum, of the American Board of Commissioners for Foreign Missions, and of the New York branch of the Colonization Society. He bequeathed to religious and charitable institutions \$371,000 and intrusted to his son a fund of \$100,000 to dispose of in charity. Ansonia, Conn., was named in his honor.

PHELPS, AUSTIN (1820-90). An American clergyman and author. He was born at West Brookfield, Mass., was educated at the University of Pennsylvania and at Andover and Union Theological Seminaries, and the Yale Divinity School. In 1842 he became pastor of the Pine Street Congregational Church in Boston, where he remained until 1848, when he accepted the chair of sacred rhetoric at Andover Theological Seminary. He remained there for 30 years, assuming in 1869 the presidency in connection with the work of his professorship. In 1879 he resigned both positions because of ill health and thereafter lived in retirement, though freely contributing, mainly through the columns of the *Congregationalist*, to current theological discussions. He published several devotional works, and a number of volumes which were the outgrowth of his professional duties, among which may be mentioned. *Studies of the Old Testament* (1879); *The Theory of Preaching* (1881); *Men and Books* (1882); *English Style in Public Discourse* (1883); *My Study and Other Essays* (1886); *My Note-Book: Fragmentary Studies in Theology and Subjects Adjacent thereto* (1889). Consult his *Life* by his daughter, Elizabeth Stuart Phelps Ward (New York, 1891).

PHELPS, EDWARD JOHN (1822-1900). An American political leader and diplomat, born at Middlebury, Vt. He graduated at Middlebury College in 1840 and three years later was admitted to the bar in his native town. In 1845 he removed to Burlington, where he remained until 1851, when he was appointed Second Comptroller of the United States Treasury. He was then a proslavery Democrat and was afterwards a strong opponent of the Civil War. In 1870 he was a member of the Vermont Constitutional Convention. Ten years later he was elected president of the American Bar Association and in 1881 was appointed Kent professor of law at Yale. This position he held until his death. He was absent from his chair during his term as Minister to the Court of St. James's, London (1885-89). In 1893 he was appointed

senior counsel for the United States in the Berlin Sea arbitration. Among his publications are *The Life and Character of Charles Linsley*, and a posthumous collection of his *Orations and Essays* (1901), edited by J. G. McCullough, to which is prefixed a *Memoir* by J. W. Stewart.

PHELPS, ELIZABETH STUART (1815-52). An American author, the daughter of Prof. Moses Stuart of Andover Theological Seminary, wife of Prof. Austin Phelps of the same institution, and mother of Elizabeth Stuart Phelps Ward. She was born in Andover, Mass. Her tales of New England and chiefly of clerical life showed considerable promise. Her *Sunnyside* (1851, republished in Edinburgh as *Manse of Sunnyside*) was remarkably popular.

PHELPS, ELIZABETH STUART. See WARD, ELIZABETH STUART PHELPS.

PHELPS, JOHN WOLCOTT (1813-85). An American soldier, born at Guilford Centre, Vt. He graduated at West Point in 1836 and soon thereafter participated in campaigns against the Creeks and Seminoles. During the Mexican War he was engaged in several of the most important battles and in 1850 was commissioned captain of the Fourth Artillery. In 1859 he resigned from the army, but on the outbreak of the Civil War entered the Federal service as colonel of the First Vermont Volunteers. On May 17, 1861, he was commissioned brigadier general of volunteers and was sent to occupy Newport News. He took military possession of Ship Island, Miss., in November, 1861, and cooperated with Farragut in opening up the lower Mississippi in April, 1862. After the occupation of New Orleans he, on his own initiative, organized the first negro troops enrolled for service in the Federal armies. This action caused great excitement among the Confederates, whose government on Aug. 21, 1862, declared him an outlaw for having organized and armed negro slaves. The authorities at Washington were not then ready to support Phelps and ordered the troops to be disbanded and to be employed as laborers. On receiving this order General Phelps resigned, Aug. 21, 1862, and took no further part in the war. During the latter years of his life he devoted himself to an Antimasonic agitation and in 1880 was nominated for the presidency by the American party (q.v.). He wrote several books, including a *History of Madagascar* (1884) and the *Fables of Florian* (1888), and translated De la Hodde's *Sociétés secrètes de France* (1884). Consult C. H. C. Howard, *Life and Public Services of Gen. John Wolcott Phelps* (Brattleboro, Vt., 1887).

PHELPS, OLIVER (1749-1809). An American merchant and land speculator, born in Windsor, Conn. In 1788 he, with Nathaniel Gorham, contracted to buy from Massachusetts 6,000,000 acres of land in the Genesee country of New York for £300,000, to be paid in consolidated stock, a scrip issued by Massachusetts and then much depreciated. This tract was included within the charter limits of both States, and by a compromise in 1786 ownership was given to Massachusetts, while New York retained the sovereignty. The Indian title to 2,600,000 acres was extinguished and a land office was opened at Canandaigua, N. Y. The rapid rise in price of the scrip made full payment impossible, and the remainder of the original tract was surrendered to the State. In 1790 Phelps sold to Robert Morris the unsold portion of the pur-

chase, about 2,100,000 acres. In 1795, with Gideon Granger and others, he purchased from Connecticut 3,300,000 acres in Ohio, the so-called Western Reserve, but soon sold his interests and returned to Canandaigua. From 1803 to 1805 he was a member of Congress and was later a circuit judge. He took an active interest in the construction of the Erie Canal and built steamers on Cayuga Lake.

PHELPS, SAMUEL (1804-78). An English actor and manager, born and educated at Devonport. He made his first appearance in an amateur performance at the Olympic in 1825. After playing in the provinces he made his debut in London as Shylock at the Haymarket (1837), and he appeared the same season with Macready at Covent Garden. He rivaled that actor and Charles Kean in certain Shakespearean rôles, such as Lear, Othello, Macbeth, and Antony, and was equally strong in the comic characters Falstaff, Bottom, and Christopher Sly; but his most notable achievement was his joint managership of the Sadler's Wells Theatre, Islington (1844-62), where he produced more than 30 of Shakespeare's plays and those of other legitimate dramatists, with incalculable educational results both upon public taste and upon the actors employed. The undertaking was less successful financially after the retirement of Thomas Greenwood, the business partner (1860), and Phelps had abandoned it for a Drury Lane engagement by 1863. Consult Phelps and Forbes-Robertson, *Life and Life-Work of Samuel Phelps* (London, 1886).

PHELPS, WILLIAM LYON (1865-). An American English scholar, born at New Haven, Conn., and educated at Yale (A.B. 1887; Ph.D. 1891) and at Harvard (A.M. 1891). At first instructor (1892-96) in English at Yale, he was subsequently assistant professor of the English language and literature and after 1901 Lampson professor, being notably successful as a teacher. His editorial work includes: *The Novels of Samuel Richardson* (20 vols., 1902-03); *The Works of Jane Austen* (12 vols., 1906); *Marlowe's Plays* (1912). He is the author of: *The Beginnings of the English Romantic Movement* (1893); *The Pure Gold of Nineteenth Century Literature* (1907); *Essays on Modern Novelists* (1910); *Essays on Russian Novelists* (1911); *Teaching in School and College* (1912); *Essays on Books* (1914); *Robert Browning: How to Know Him* (1915). He was honored with membership in the National Institute of Arts and Letters.

PHENACETIN, fê-nâs'ê-tin (from *phenol* + *acetine*), ACETPHENETIDINE. A coal-tar derivative strongly resembling acetanilid (q.v.). It occurs as a tasteless and odorless, white, glossy, crystalline powder. It is slightly soluble in water and freely in alcohol. Its physiological action and uses are similar to those of antipyrine (q.v.). The after effects of phenacetin are, however, less marked than those following antipyrine, and it is considered safer. It is employed chiefly for the relief of pain.

PHENACODUS (Neo-Lat., from Gk. φέναξ, *phenax*, cheat + Lat. *coda*, *cauda*, tail). One of the earliest fossil ungulates, or hoofed mammals, skeletons of which are found in the Lower Eocene beds of Wyoming. It is one of the most primitive ungulates, belonging to the suborder Condylarthra, in which group the carpal and tarsal bones of the feet are wholly serial, and it presents some characters indicative of its

creodont ancestry. It was a small animal of slender build, between 5 and 6 feet long, with small head, piglike teeth, low fore quarters, hind limbs that were much more powerful than the fore limbs, and with a long, slender tail. The feet were five-toed and somewhat digitigrade, and the large size of the second, third, and fourth toes suggests that these were of more use in running than were the other two. A finely mounted skeleton of this animal is in the American Museum of Natural History in New York City.

PHENIC ACID. See CARBOLIC ACID.

PHENICIA, fê-nish'â. See PHENICIA.

PHENICIN (Fr. *phénicine*, from Gk. φοινίξ, *phoinix*, purple red), or PHENYL BROWN. A rich dye, first prepared by Roth in 1863 by the action of nitric and sulphuric acids on carbolic acid or phenol in the cold. It is a brown, amorphous powder, very soluble in alcohol, ether, and acetic acid, but only slightly soluble in water. It consists of two coloring matters, one yellow, dinitrophenol, C₆H₃(OH)(NO₂)₂, the other a brown, humus-like body of unknown composition. Phenicin was formerly much used in coloring leather.

PHENOCRYST (from Gk. φαίνω, *phainein*, to show, appear + κρύσταλλος, *kryсталlos*, crystal). The name used in petrology to designate crystal individuals in a rock that possesses more perfect boundaries and are of larger size than the remaining constituents. A rock containing such crystals is said to have a porphyritic texture. They indicate that a rock has passed through two stages of crystallization, the first leading to the formation of the phenocryst and the second to the formation of the ground mass. The first stage generally takes place while the rock mass exists in a molten condition within the earth; while the ground mass is the result of rapid cooling after the rock has been erupted.

PHENOGAMS. See PHANEROGAMS.

PHENOL, fê'nôl. See CARBOLIC ACID; PHENOLS.

PHENOL'OGY (abbrev. of *phenomenology*, from Gk. φαινόμενον, *phainomenon*, phenomenon, nom. sing. neut. of pres. p. mid. of φαίνω, *phainein*, to appear + -λογία, -logia, account, from λέγω, *legein*, to say). That branch of ecology in which attempts are made to determine the influence of climatic factors on plant life by means of meteorological observations. See DISTRIBUTION OF PLANTS.

PHENOLPHTHALEIN, -thâl'ê-in, C₉H₆[C(C₆H₄OH)₂][CO]O. A crystalline chemical substance prepared by heating carbolic acid (phenol) with the anhydride of phthalic acid in the presence of strong sulphuric acid. It is insoluble in water, but dissolves readily in alcohol, producing a colorless solution. With alkalis phenolphthalein forms beautifully red-colored salts, and therefore the addition of a few drops of alcoholic phenolphthalein to a solution containing even a trace of free alkali produces a distinct red coloration—a fact utilized for the detection of alkalinity and also for the quantitative determination of the amount of alkali in solutions. When an alkaline solution colored red by phenolphthalein is acidified, the color disappears. (See LITMUS.) Phenolphthalein is also extensively used as a laxative, under various trade names. But while at one time believed to be an ideal, in the sense of perfectly harmless, laxative, it is now known to

be capable of producing faintness and other symptoms of poisoning.

PHENOLS (Fr. *phénol*, from Gk. *phálein*, *phainein*, to appear). An interesting class of carbon compounds, the simplest of which is ordinary carboic acid (q.v.). The phenols are derivatives of benzene, and they are characterized chemically by one or more hydroxyl groups attached immediately to the so-called benzene nucleus (a ring made up of six atoms of carbon). The phenols are distinguished from the alcohols (q.v.) by having the properties of acids. Thus, unlike the alcohols, they combine with metallic hydroxides to form phenates (the alcohols form alcoholates with the alkali metals themselves, but not usually with their hydroxides). On the other hand, they are distinguished from acids by containing no carboxyl group (COOH) and by being weaker than the weakest carboxylic acid known, viz., carbonic acid. Their weakness as acids may be readily demonstrated by passing a current of carbonic acid gas into a solution containing, say, phenate of sodium; the carbonic acid will then take the sodium away from the phenol, sodium carbonate will be formed, and the phenol will be set free. Among the characteristic reactions of the phenols must also be mentioned the fact that they all give colorations with ferric chloride. The principle on which fatty alcohols, phenals, and aromatic alcohols are classified and distinguished from one another symbolically may be seen from the following formulas showing simple representatives of the three classes in question

CH_3OH	$\text{C}_6\text{H}_5\text{OH}$	$\text{C}_6\text{H}_5 \cdot \text{CH}_2 \cdot \text{OH}$
Methyl alcohol	Carboic acid	Benzyl alcohol
(fatty)	(a phenol)	(aromatic)

The distinction between the fatty alcohol and the other two substances is in the hydrocarbon radicals which hold the hydroxyl groups; the distinction between the phenol and the aromatic alcohol is in the fact that in the former the hydroxyl group is attached directly to one of the atoms of the group C_6 , while in the latter the hydroxyl is linked to the C_6 ring by the group CH_2 . Naphthalene (q.v.), anthracene (q.v.), and other polycyclic substances yield derivatives analogous to the phenols yielded by benzene. See ACIDS.

PHENOMENON. A philosophical term meaning that which appears. See NOUMENON.

PHENYL (from *phenol*), C_6H_5 . A chemical radical, i.e., a group of atoms possessed in common by the molecules of different compounds, but incapable of independent existence. See CARBON COMPOUNDS; VALENCE.

PHENYLAMINE. See ANILINE.

PHENYLENE BROWN. See COAL-TAR COLORS.

PHÉRÆ (Lat., from Gk. *Φερά*). An ancient city of southeastern Thessaly, about 10 miles west of its harbor, Pagasæ, where in recent years a remarkable series of painted late Greek grave stelæ have been found, at the head of the Pagasæan Gulf, in Greek legend, the ancient royal seat of Admetus and Alcestis. In the early part of the fourth century B.C. the power was in the hands of Jason, son of Lycophron, who had become tyrant about the close of the Peloponnesian War. Jason was a man of marked ability, and by B.C. 374 had forced his recognition as chief of the Thessalians and began to play an important part in the affairs of Greece, while it was said that he meditated

the invasion of Persia. He was assassinated in 370 B.C. His nephew, Alexander, succeeded to his rule, but was soon confined by the Thebans to the tyranny over Phæræ. After displaying the utmost cruelty for 11 years, he was finally murdered by his wife's brothers, 367 B.C. Five years later Phæræ, with the rest of Thessaly, became subject to Philip of Macedon. At Phæræ there was a mineral spring named Hyperia, famous for its healing virtues, which still flows in the centre of the modern village of Veles-tino. Consult Meineke, *Strabonis Geographica* (1904).

PHERECRATES, fê-rêk'ra-têz (Lat., from Gk. *Φερεκράτης*, *Pherekratês*). One of the most eminent writers of the Old Attic Comedy; a contemporary of Cratinus, Crates, Eupolis, Plato, and Aristophanes. He invented the Pherecrætean metre (see LOGÆDIC VERSE, II, 2), which is frequently used in the choruses of the Greek tragedies and in Horace. A few fragments and the titles of 18 of his plays are extant. Consult A. Meineke, *Fragmenta Comicorum Græcorum* (Berlin, 1839, 1855), and Th. Kock, *Comicorum Atticorum Fragmenta* (Leipzig, 1880). Among the ancients he was famed for his wealth of invention and the purity of his Attic Greek.

PHERECYDES, fê-rê-sî'dêz (Lat., from Gk. *Φερεκύδης*, *Pherekydês*). 1. One of the earliest writers of Greek prose. He was born in the island of Syros and flourished in the sixth century B.C. He composed a cosmogonic work on nature and the gods, entitled *Περὶ φύσεως* (*Pentemychos*), because according to its doctrine, five elements made up the universe—ether, fire, air, water, and earth. That he taught Pythagoras his doctrine of the transmigration of souls may well be doubted. A fragment of Pherecydes on the sacred marriage of Zeus and Chthonia has recently been discovered in Egypt; it is published by Grenfell, p. 22, *New Classical Fragments* (Oxford, 1897). The fragments formerly known, together with those of the following author, are published by Müller, *Fragmenta Historicorum Græcorum* (Paris, 1850). Consult H. Diels, *Fragmente der Vorsokratiker* (1903), and Theodor Gomperz, *Greek Thinkers*, vol. i (Eng. trans. by L. Magnus, New York, 1905).

2. A logographer and native of Leros, who flourished in the middle of the fifth century B.C. He spent the greater part of his life at Athens, where he wrote his *Genealogies* or *Autochthonês* (*Γενεαλογίαι* or *Αὐτόχθονες*), a work of ten books in the Ionic dialect, on the descent of the gods and the noble Greek families. The extant fragments are published as indicated under 1 above. Consult, also, Luetke, *Pherecydæa* (Göttingen, 1893), and H. Bertsch, *Pherekydeische Studien* (1898). For both 1 and 2, consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (5th ed., Munich, 1908).

PHÉRÉTIMA. Wife of Battus III and mother of Arcesilaus III, kings of Cyrene. To avenge the murder of her son by the Barcæans she induced the Persian Viceroy in Egypt to attack their city. After the city fell she caused those chiefly responsible for her son's death to be impaled and the breasts of their wives to be cut off.

PHERSA'LA, or **PHARSALA.** The modern name of the Greek city Pharsalus (q.v.).

PHI BETA KAPPA. An honorary college fraternity, the oldest of the Greek-letter frater-

nities. It was organized at William and Mary College in Williamsburg, Va., Dec. 5, 1776, as a secret social club, and literary society and chapters were established at Yale (1780), at Harvard (1781), and then at Dartmouth (1787). Subsequently, in response to the agitation against secret fraternities, its secret character was abandoned by the Harvard chapter, and this lead the chapters at Yale and Dartmouth soon followed. For nearly half a century it was the only college fraternity in the United States that was devoted to literature and philosophy, and Phi Beta Kappa days at commencements became noteworthy by orations and poems which had an important influence on the early literature of the United States.

There were, in 1915, 86 chapters in as many different colleges, as follows (in addition to the four already mentioned): Union (1817), Bowdoin (1825), Brown (1830), Trinity (1845), Wesleyan (1845), Western Reserve (1847), Vermont (1848), Alabama (1851), Amherst (1853), Kenyon (1858), New York University (1858), Marietta (1860), Williams (1864), College of the City of New York (1867), Middlebury (1868), Rutgers (1869), Columbia (1869), Hamilton (1870), Hobart (1871), Colgate (1878), Cornell (1882), Dickinson (1887), Lehigh (1887), Rochester (1887), De Pauw (1889), Northwestern (1890), Kansas (1890), Lafayette (1890), Tufts (1892), Pennsylvania (1892), Minnesota (1892), Iowa (1895), Johns Hopkins (1895), Nebraska (1895), Colby (1896), Syracuse (1896), Swarthmore (1896), Wabash (1898), California (1898), Haverford (1898), Vassar (1898), Wisconsin (1899), Boston (1899), Cincinnati (1899), Princeton (1899), St. Lawrence (1899), Chicago (1899), Vanderbilt (1901), Missouri (1901), Allegheny (1902), Colorado University (1904), Smith (1904), Stanford (1904), North Carolina (1904), Colorado College (1904), Wellesley (1904), Ohio State (1904), Mount Holyoke (1905), Texas (1905), Goucher (1905), Oberlin (1907), Ohio Wesleyan (1907), Illinois (1907), Michigan (1907), Franklin and Marshall (1908), Grinnell (1908), Virginia (1909), Tulane (1909), West Virginia (1910), Denison (1911), Indiana (1911), Washington and Lee (1911), Miami (1911), Beloit (1911), Lawrence (1914), Pomona (1914), Georgia (1914), Carleton (1914), Washington State (1914), Radcliffe (1914), Washington University (1914), and North Dakota (1914).

Women were not admitted until 1875, and in 1898 Vassar received the first charter given to a woman's college. Four chapters have instituted sections in the affiliated colleges for women, viz., Brown, Columbia in Barnard, Western Reserve, and Hobart in William Smith.

Active membership varies in its details with different chapters, but, as a rule, it is extended to members of the senior class studying for a baccalaureate degree in arts or science as distinguished from those studying for technical or professional degrees; usually also not more than the quarter of a class standing highest is elected, and in many colleges eligibility is further restricted to those who reach a certain percentage. Sometimes elections are made in the junior year as a mark of special distinction. Alumni members are chosen from distinguished alumni, and honorary members are selected from those who have achieved eminence in some branch of learning. Associations have been organized

in New York, Indianapolis, Cleveland, Washington, and Albany, and in Tokyo, Japan, in which membership is confined to graduate and honorary members of the Phi Beta Kappa Society. In 1914 there were 27,645 members, of whom 6613 were women.

The badge consists of a watch key with the Greek letters "ΦΒΚ" standing for the motto "Φιλοσοφία Βίου Κυβερνήτης" (Philosophy the guide of life), and a hand pointing to a group of stars in the upper left-hand corner indicative of the noble aspirations of the fraternity. On the reverse are the letters "S.P.," the initials of the words "Societas Philosophiae," and the date, Dec. 5, 1776, when the society was organized, as well as the name of the owner, with his college and the date of his graduation. See Plate with article SOCIETIES, and article FRATERNITIES.

In 1882, at the suggestion of the Harvard Chapter, delegates met in Saratoga Springs, N. Y., and issued a call for a national organization, which was convened on Sept. 5, 1883. At this time delegates from 16 chapters ratified the constitution and organized a National Council of the United Chapters of Phi Beta Kappa, consisting of 20 senators and delegates not exceeding three from the several chapters of the society. The influence of this council is directed chiefly toward the establishment of uniform customs in regard to membership, details of election, etc. It meets triennially. Under its supervision a general catalogue containing in some form the names and addresses of the 17,000 members of the fraternity was issued in 1900; but since 1910 this and other pertinent information has been given in the *Phi Beta Kappa Key*, which is issued quarterly. There is an extensive literature, consisting of addresses, poems, etc., single and collected, that have been delivered before the various chapters, a bibliography of which is being published in the *Key*. Consult P. S. Northrup and others (eds.), *Representative Phi Beta Kappa Orations* (Boston, 1915).

PHIDARI. A river in Ætolia, Greece (Map: Greece, C65). The Phidari rises in the Vardusia Mountain and after a southwesterly course of about 65 miles flows into the Gulf of Patras.

PHIDIAS, or **PHIDIAS** (Lat., from Gk. *Φειδίας*). The greatest sculptor of ancient Greece, born in Attica, probably between 500 and 490 B.C., the son of Charmides. His master seems to have been the Athenian Hegias, famous for his statues of divinities, and some late authorities connect him with the Argive Hage-laidas also; but both these statements have been questioned, and in general the information as to his life is scanty and is often contradictory. Interest in the lives of the great artists arose comparatively late, when accurate information was scarcely attainable. For our knowledge of his works we are dependent on the statements of ancient writers, as no certain original from his hand has survived. The descriptions, however, warrant the assignment to him of the originals from which several marbles were copied, and to his designs we probably owe the sculptures of the Parthenon (q.v.), though none of them can with certainty be attributed to his hand. The unanimous testimony of the ancients and the evidence of the monuments mark him as the typical artist of the best culture of Greece. His genius found the soil for its ripest

expression in the Athens of Pericles (q.v.), and his works stand with the tragedies of Sophocles as the most perfect expression of the spirit of the noblest period of Greek civilization. Noble ideals and a thorough mastery of technic enabled him beyond any other ancient artist to present beauty in its purity and completeness. In his works we find incorporated the desire of Greek art to reproduce the ideal beauty that lies behind the realities of nature, which, while holding fast to truthful expression, seeks to show forth the typical and permanent elements rather than the individual and transitory. This endeavor to express the sublime ideals formed within the soul was recognized by the ancients as the source whence came the inspiration for the colossal statue "Zeus" at Olympia, which the artist was said to have drawn from Homer (*Iliad*, i, 529), and which seemed to incorporate the divine majesty, power, and loving-kindness. In all branches of sculpture we find Phidias celebrated. In bronze were wrought by him the "Athena" of the Lemnians, probably represented in a statue at Dresden and a head at Bologna, and the colossal "Athena" sometimes called the "Promachos," which ancient tradition at any rate attributed to him; in marble, an "Aphrodite" in Athens, and the face, hands, and feet of an "Athena" at Plataea, whose drapery was of gilded wood, thus forming a cheap substitute for the chryselephantine technic in which he attained his greatest fame. His earliest work in this style was an "Athena" at Pellene in Achæa, but his most celebrated were the "Zeus" at Olympia (q.v.) and the "Athena" of the Parthenon. In this style a core of wood was overlaid with ivory to represent the flesh, and gold, often inlaid with enamel, for drapery. On the statue "Athena" in the Parthenon the gold was detachable and was valued at 44 talents. The "Zeus" at Olympia represented the god seated on his throne, wearing on his head a wreath of olive, and holding in his left hand the sceptre crowned with an eagle; on his extended right hand stood a "Nike" (Victory) holding a fillet. The throne was elaborately decorated with figures in relief and in the round. Our only knowledge of this statue is from descriptions and representations on late coins of Elis, which are, of course, far too small to give any satisfactory idea of its appearance. It may be added that the so-called "Zeus Otricoli" of the Vatican is certainly not Phidian. The "Athena Parthenos" was a standing figure. In her left hand the goddess held her lance, and at her left side stood the shield. The extended right hand also held a "Nike" and was perhaps supported by a pillar. Here, too, the shield, the pedestal, the helmet, and even the soles of the sandals were decorated with scenes from Grecian legend. This statue was erected in 438 B.C., and if Phidias supervised the decorations of the Parthenon he must have worked in Athens from about 447 to 433 B.C., for the building was not completed before this date. The chronology and events of the closing years of his life are much disputed, and the ancient testimony is conflicting. All accounts agree that he was tried at Athens for embezzling the gold appropriated for the statue; but, while one account says he died in prison, another says he was banished, went to Elis, made the statue "Zeus" at Olympia, and was then accused and put to death by the Eleans. This last can scarcely be right, as we know his descendants

enjoyed hereditary honors at Olympia. The most probable theory is perhaps that the statue "Zeus" was made just after the middle of the fifth century B.C. and that after this achievement the artist remained in Athens. It may be regarded as certain that he shared in the attack on the friends of Pericles, and the account may be true that, while acquitted of the charge of embezzlement, he was condemned for impiety in introducing his portrait on the shield of the "Athena Parthenos." Many competent archaeologists, however, prefer to date the "Zeus" later than the "Parthenos."

Bibliography. In addition to the histories of Greek sculpture cited under GREEK ART, consult: C. O. Müller, *De Phidias Vita et Operibus* (Göttingen, 1827); Eugen Petersen, *Die Kunst des Phidias* (Berlin, 1873); Charles Waldstein, *Essays on the Art of Phidias* (New York, 1885); Maxime Collignon, *Phidias* (Paris, 1886); Adolf Furtwängler, *Masterpieces of Greek Sculpture*, translated by E. Sellers (New York, 1895), of great value for the attribution of extant marbles to Phidian originals, but to be used with caution; *Phidias* in "Masters in Art Series" (Boston, 1902), with good bibliography; E. A. Gardner, *Six Greek Sculptors* (London, 1910); id., *A Manual of Greek Sculpture* (ib., 1911); H. H. Powers, *The Message of Greek Art* (New York, 1913); Percy Gardner, *The Principles of Greek Art* (ib., 1914); and the works on Athens, by D'Ooge, Gardner, and Weller, cited under PARTHENON. For the death of Phidias, consult in addition: Loescheke, "Phidias' Tod," in *Historische Untersuchungen* (Bonn, 1882); Schöll, "Der Prozess des Phidias," in *Sitzungsberichte der Münchener Akademie* (Munich, 1888).

PHIDON. Son of Aristodamidas and King of Argos, eighth century B.C. He restored several towns to the Kingdom, but did not succeed in his ambition to extend his authority throughout the Peloponnesus. He is best remembered for the introduction of copper and silver coinage and of a new scale of weights and measures. This system, which finally was used throughout the larger part of Greece, was known as the Æginetan, from Ægina, whose inhabitants through their commerce did most to extend its use.

PHIGALIA. A town of ancient Arcadia, now in the Olympia district of the Province of Messenia, 25 miles northwest of Messene. Near by are the falls of Neda. In 659 B.C. Phigalia was taken by the Spartans, but later became free. Its celebrity in modern times rests on the fact that the ruins of a magnificent temple of Apollo stand on Mount Cotylum at Bassæ in the Commune of Phigalia, about five miles from the town proper. Consult K. Baedeker, *Greece*, 392-396 (4th Eng. ed., Leipzig, 1909), and J. P. Mahaffy, *Rambles and Studies in Greece* (7th ed., New York, 1913). See PHIGALIAN MARBLES; ICTINUS.

PHIGALIAN MARBLES. The sculptured frieze taken from the interior of the cella of the temple of Apollo at Bassæ, 5 miles from Phigalia (q.v.), in Arcadia, in 1814, and transferred to the British Museum. It represented the contest between the Centaurs and the Lapithæ and the Greeks and the Amazons. The temple is situated in the extreme southwest of Arcadia, about four miles from Phigalia, on a terrace on the side of a mountain in a picturesque and wild country, and had been completely forgotten

till it was discovered accidentally in 1765 by a French architect, Bochor, and soon after was visited and described by the English traveler Chandler, who was followed by Gell, Dodwell, and others. In 1811 and 1812 it was carefully examined by a body of English and German artists and scholars, the results of whose investigations are given in Stackelberg, *Der Apollo Tempel zu Bassa in Arkadien* (Rome, 1826), and Cockerell, *The Temples of Jupiter Panhellenius at Aigina and Apollo Epicurus at Bassa, near Phigaleia, in Arcadia* (London, 1860). The temple of Apollo is of a hard yellowish-brown limestone and is a Doric hexastyle peripteros, with 15 columns on the sides, about 125 feet long and 46 feet wide. Owing to the nature of the ground, its main axis runs north and south, but there is a small side door in the east wall of the cella, opposite the cult statue. Of the 38 columns, 35 are still standing and support much of the architrave, though the pediments and the ceiling have fallen. The fallen members lie about the ruin, which appears to have been largely caused by Christian iconoclasm and greed for the metal clamps by which the stones were held. From 1903 on M. Kavvadias, acting for the Greek Archaeological Society, used the existing remains in a restoration of the building. The sculptures show great skill and boldness in design, but the execution is by no means so praiseworthy, as the proportions are often bad and the faces dull. As the temple was the work of Ictinus, the architect of the Parthenon, it is very probable that the sculptures were designed by an Athenian artist, but the carving is probably the work of less experienced Arcadian sculptors. The fragmentary sculptures on the metopes of the pronaos and opisthodomos are of rather better workmanship. In addition to the general works cited under GREEK ART, by Collignon, Overbeck, Mitchell, and Murray, consult: "Phigaleia" in K. A. Baumeister, *Denkmaler des klassischen Altertums*, vol. iii (Munich, 1888); A. H. Smith, *Catalogue of the Sculptures in the British Museum* (3 vols., London, 1892-1904); K. Baedeker, *Greece*, 392-394, with plan (4th Eng. ed., Leipzig, 1909); J. P. Mahaffy, *Rambles and Studies in Greece* (7th ed., New York, 1913). See ICTINUS.

PHI KAPPA PHI. An honor society organized in 1897 and composed of graduate and undergraduate members of all departments of American universities and colleges. Its objects are to emphasize scholarship in the thought of college students, to hold fast to the original purpose for which institutions of learning were founded, and to stimulate mental achievement by the prize of membership; also to bind more closely the alumni to their Alma Mater, to furnish an additional tie of college friendship, and to interest its members in the promotion of a more thorough education. In order to gain these objects membership is restricted to a number of students in any school or department, not exceeding one-third of the whole graduating class, who have distinguished themselves by scholarship or intellectual service to their college or university. These members are elected one year before graduation. Persons may be elected to honorary membership who have won distinction in science, literature, or education. The badge is a globe bearing the letters of the fraternity "ΦΚΦ" and surrounded by the rays of the sun arranged in eight groups,

and it may be worn as a pendant, pin, button, or medal. There are chapters in the University of Maine, University of Tennessee, Pennsylvania State College, Massachusetts Agricultural College, Delaware State College, University of Nevada, Iowa State College, University of Florida, Rhode Island Agricultural College, North Dakota Agricultural College, and Nebraska Wesleyan University. The fraternity is divided into four provinces—north, east, south, and west—each of which has a special secretary.

PHILA. Daughter of Antipater, Regent of Macedonia. She was celebrated as one of the noblest women of her time. In 322 B.C. she was married to Craterus. He died in about a year, and Phila was then married to Demetrius, son of Antigonus, and shared his varying fortunes. When Demetrius was banished from Macedonia in 287 B.C., Phila killed herself at Cassandrea. She left two children by Demetrius, Antigonus and Stratonice. The son, surnamed Gonatas, became King of Macedonia; Stratonice became the wife of Seleucus and subsequently of his son Antiochus. Consult W. W. Tarn, *Antigonus Gonatas* (Oxford, 1913).

PHILADELPHIA (Lat., from Gk. *Φιλαδέλφεια*, *Philadelphēia*, lit, brotherly love, but as a city name common in the Macedonian period it was given in honor of certain individual rulers bearing the name Philadelphia). 1. A city of Asia Minor, named in honor of Attalus II Philadelphus of Pergamum, now called Alashehr (the "reddish city," from the color of the hillsides in the rear), situated in the valley which runs inward from the Gulf of Smyrna, about 75 miles east by south of Smyrna (Map: Turkey in Asia, C 3). The city was founded in the second century B.C. It lay on the trade routes from the interior to the coast and assumed a position of commercial importance. Its name was changed at different times, as shown by the coins of Roman emperors, and it was a point of considerable importance in the political affairs of the Province of Asia. Philadelphia was the head of a district in which Christian churches were established very early, since messages were sent to it in the Book of Revelation (iii. 7-13). Little is known concerning the number or size of these churches. Philadelphia bore a conspicuous part in later history, figuring as a bulwark against the Turks. Consult W. M. Ramsay, *Letters to the Seven Churches* (New York, 1904). See ALASHEHR. 2. The later name of the ancient Rabbah, or Rabbath Ammon (q.v.), the capital of the Ammonites, captured by David (2 Sam. xi-xii). Its name was changed to Philadelphia by Ptolemy II Philadelphus, at which time it was transformed into a Greek city. It ultimately became one of the Decapolis (q.v.) and in the Roman period was a large and important city, as is evidenced by the extensive ruins on its site.

PHILADELPHIA. The chief city of Pennsylvania and the third city in population in the United States, coextensive with Philadelphia County, having an area of 129.5 square miles. It is situated in the southeast corner of the State, at the confluence of the Schuylkill and the Delaware rivers, about 50 miles from the mouth of the Delaware and 100 miles from the Atlantic Ocean, in lat. 39° 57' N. and long 75° 9' W. It is distant from New York by rail 90 miles, from Washington 136, and from Chicago 822.

The climate of Philadelphia is considerably milder in winter and warmer in summer than that of the central and western cities of the State. The mean temperature for January, is 32.6° F. and for July 76° F. The heat during July and August is often very intense, the temperature rising sometimes above 100° F. The average annual rainfall in the city is 41.8 inches, slightly heavier than that of New York.

Description. William Penn founded the city on the narrow neck of land, about 2 miles wide, lying between the Delaware and the Schuylkill rivers. Disregarding his plan for a simultaneous growth of the city backward from each river, the early settlers preferred to remain near the Delaware, along which occurred the first northern and southern expansion of the city. It was not until the beginning of the nineteenth century that growth to the west reached Broad Street, the half-way line to the Schuylkill. From this time the city has grown more rapidly, extending southward to the junction of the two rivers, westward far beyond the Schuylkill to Cobb's Creek, and northward in two main branches, the easternmost following the Delaware to a point beyond Poquessing Creek, 18 miles from the southern limit, and the westerly through the suburban region extending 10 miles along the Wissahickon, a tributary of the Schuylkill. In the western and northern regions of the city areas of open country still exist. From the dike-protected lowlands of the south, 5 feet below the average high tide, the city rises gradually to a height of 443 feet in the hilly regions of the northwest. The general plan of the streets is determined by the east and west direction of Market Street, the main business thoroughfare, 100 feet wide, which runs directly west from the Delaware, a distance of 6 miles, separating the city in respect of street numbering into north and south divisions, and by Broad Street, 113 feet wide and 12 miles long, which at City Hall Square intersects Market at right angles. The main portion of the city is laid out with great regularity, the numbered streets running parallel with Broad and the named streets with Market. The regularity of the general plan is broken, however, in the portion east of the Schuylkill, by Ridge and Germantown avenues, which intersect diagonally the streets north of Market, and by Passyunk and Moyamensing avenues, south of Market Street; in West Philadelphia, Lancaster Avenue, north, and Woodland Avenue, south of Market Street, act in a similar manner, though in this and in other outlying sections there is, in general, less attempt to follow strictly the regularity of the older portions of the city. There are approximately 1615 miles of streets, of which 527 miles are paved with asphalt and 10 miles with wood blocks. The mileage of sewers is 1300 and of water mains 1800. The street railways (employing the overhead trolley system, and in 1914 carrying 588,854,662 passengers) have a total mileage of 664, and the steam railroads of 750. The Market Street Subway extends from the Delaware River to the Schuylkill, and its elevated extension follows Market Street to Sixty-ninth. The new comprehensive plans for rapid transit include a Broad Street Subway extending from Market Street south to League Island and north to City Line. An elevated line running north on Second Street to Frankford also is projected. Eighteen railroad and city bridges

cross the Schuylkill, and one railroad bridge crosses the Delaware; some of these are among the finest structures of their kind.

It is possible to characterize with tolerable accuracy the various sections of Philadelphia. The business life gathers around Market Street. The region north and south of this thoroughfare bordering the Delaware is devoted to wholesale trade, shipping, and warehouses; from Third Street to Fifteenth, Arch, Market, Chestnut, and Walnut Streets may be designated as the banking, financial, and shopping centres. Just southeast of City Hall Square stands the Wanamaker store. At the northwest corner of Broad and Market streets is found the Broad Street Station of the Pennsylvania Railroad, and at Twelfth and Market streets stands the Terminal Building of the Philadelphia and Reading Railroad. The Baltimore and Ohio Railroad Station is situated at Twenty-fourth and Chestnut streets. Less important business centres lie in West Philadelphia along Lancaster Avenue and Fifty-second Street; in North Philadelphia along Girard, Columbia, and Lehigh avenues; in Germantown along Germantown Avenue, and in Frankford along Frankford Avenue. Large manufacturing establishments are scattered throughout the city. The Kensington district is justly known as the centre of the textile industry. At Port Richmond is located Cramp's Shipyard. The model plant of the Stetson Hat Factory is found at Montgomery Avenue and Fourth Street. The central plant of the Baldwin Locomotive Works covers several acres west of Broad Street along Spring Garden. The Disston Saw Works cover a large area on the Delaware River at Tacony. Along the Schuylkill at Manayunk are situated the great carpet mills, and farther south, at the junction of the Schuylkill and the Delaware rivers, are large oil refineries and coal wharves.

The more aristocratic residential section clusters about Rittenhouse Square. The foreign quarter, with an unmistakable Italian aspect, lies in the southeastern part of the city. The negro quarter lies slightly to the west of this. The slums may be found in limited areas in different parts of the city, although the worst districts are to be found in the older portion of the city lying between Vine and South streets, east of Broad. One of the noticeable features of Philadelphia is its charming suburban territory, unsurpassed by that of any city in the world, extending in some places beyond the city limits. To the north lie the old established communities of Germantown, Chestnut Hill, Whitemarsh, Ambler, Fort Washington, and Jenkintown contiguous to the Reading Railway, and Old York Road. Along the main line of the Pennsylvania Railroad lie the wealthy suburbs of Overbrook, Merion, Ardmore, Haverford, Bryn Mawr, Villa Nova, Wayne, and Paoli.

By its name Philadelphia suggests its distinctive title, the City of Brotherly Love; its early history renders especially appropriate that of the Quaker City, but none more truly characterizes it than that of the City of Homes. Of 400,000 buildings of all kinds (1914), 360,000 are dwelling houses, with an average of 5.2 persons per dwelling and with 35 per cent owned by the occupants. There are 987 church buildings, 450 schools, public and private, and 483 buildings used for charitable and benevolent purposes. In the older quarters there are many

survivals of the long blocks of red-brick houses, with white marble steps and trimmings, that early gave Philadelphia the neat appearance for which it is still famous. In the newer parts red brick is still the principal building material, and the residences are commonly built in long blocks of houses of four or more similarly arranged rooms, each separated from its neighbors by a brick party wall and varying in size with the width of the street. On some of the larger streets the houses are built in pairs, instead of in blocks, but the interior plan of the separate houses is the same. There is, however, a more welcome variety in styles of architecture than formerly, and various kinds of building stone, along many streets, are beginning to break the monotony of the customary brick, while in the better suburbs the residences are almost wholly of stone or wood. In general, Philadelphia, in its homes and parks, may be said to retain to a greater degree than any other large American city the finer qualities of its early town life and to combine with these the best features of modern industrial development.

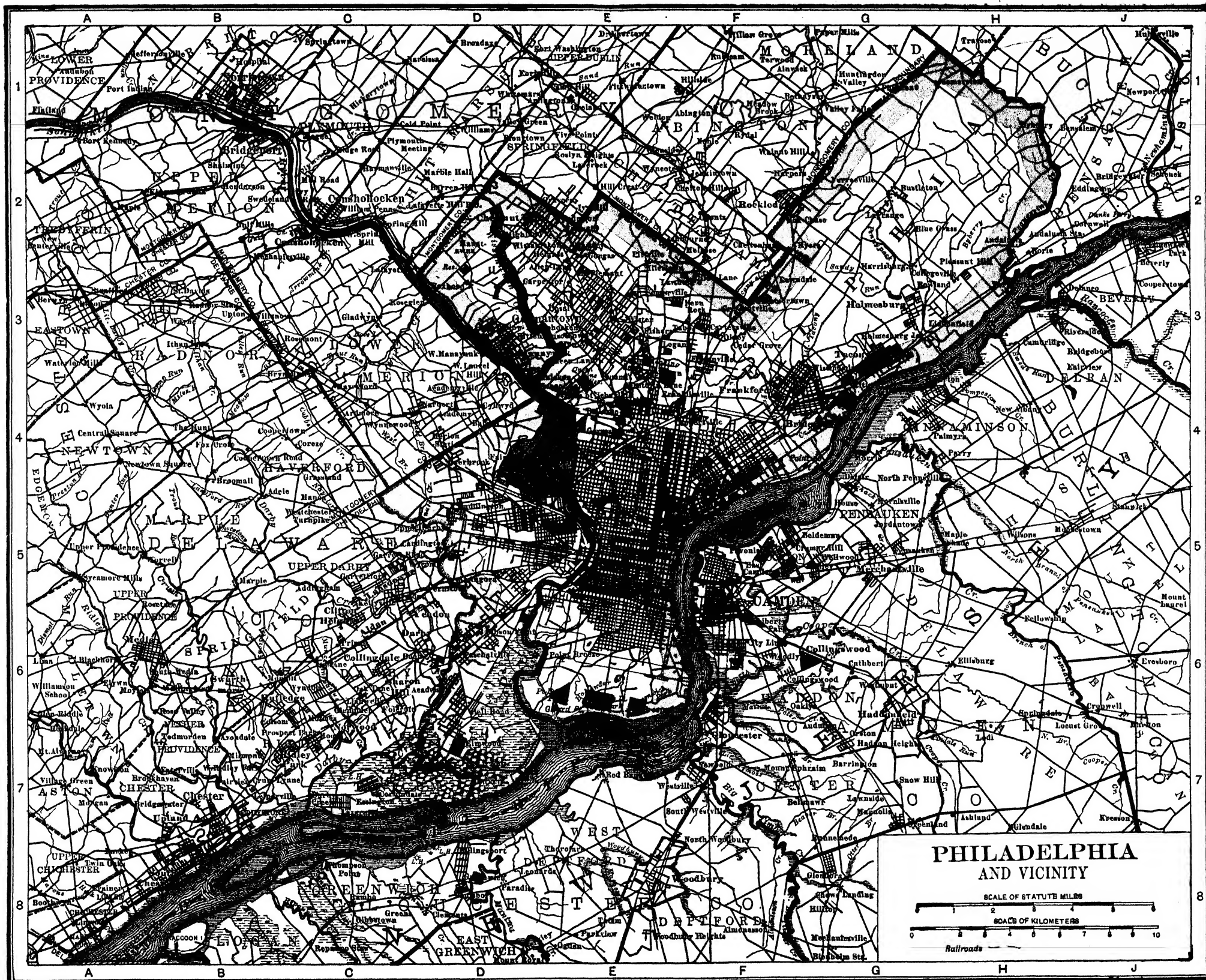
Buildings. Adherence to an early architectural idea has made Philadelphia one of the last of large American cities to favor tall buildings. Recently, however, a group of tall structures has sprung up in the vicinity of the Public Buildings, as Philadelphians designate their City Hall. This immense structure, begun in the early seventies and covering $4\frac{1}{2}$ acres, accommodates nearly all the municipal and county offices and the State and county courts. It is a marble edifice, of modern French Renaissance style, 90 feet high, rising in corner pavilions to 161 feet, in central pavilions to 203 feet, and in the tower surmounted by a colossal statue of William Penn (37 feet high and weighing 53,348 pounds) to a height of 547 feet, $11\frac{1}{4}$ inches. The building, inclosing a large central court, measures 486 feet, 6 inches by 470 feet, and in it are 662 rooms, with a floor space of $14\frac{1}{2}$ acres. In the tower are four great clock dials, each with a minute hand 11 feet long and weighing 225 pounds and regulated by a vibration and temperature-proof clock 143 feet below. The Public Buildings thus far have cost more than \$24,000,000. The assessed valuation of all the municipal buildings in 1914 was \$319,000,000.

Among the important Federal buildings are the United States Mint, on Spring Garden Street, one of the largest in the world, the Post Office Building, bounded by Market, Chestnut, Tenth, and Ninth streets, occupying the site of the first President's mansion and the subsequent home of the University of Pennsylvania; the Custom House, on Chestnut Street near the Delaware River, modeled after the Parthenon and erected in 1819-24 for the Second United States Bank; the Arsenal, below South Street near the Schuylkill; and at the southern end of Broad Street the large League Island Navy Yard. On Chestnut Street, between Fifth and Sixth, stands Independence Hall, America's most famous landmark. It was built in 1735 and used as the State House until 1799. After many architectural changes it has been finally restored to its original form, following the plans made by its designer, Andrew Hamilton. Here met the Second Continental Congress, May 10, 1775. Here, on June 15, 1775, Washington was made Commander in Chief of the American Army. On June 7, 1776, Richard

Henry Lee introduced the motion which on July 2, 1776, culminated in the freeing of the Colonies from British rule. On July 4, 1776, was adopted the Declaration of Independence of Thomas Jefferson and his committee. From the tower of this building pealed forth the notes which "proclaimed liberty throughout all the land unto all the inhabitants thereof." The sacred Liberty Bell now reposes on the main floor, directly beneath the historic tower under which it formerly hung.

Old Congress Hall, restored in 1913, stands at the northwest corner of Sixth and Chestnut streets. Here Congress sat from 1790 to 1800. In this building Washington was inaugurated in 1793 and John Adams in 1797. The old City Hall, where the United States Supreme Court sat from 1791 to 1800 is located at the northeast corner of the square. Carpenter's Hall on Chestnut Street is inseparably associated with the first Continental Congress, the Betsy Ross House is on Arch Street, where the first American flag is said to have been made, the Old Swedes (1700) and Old Christ (1727) churches are of Revolutionary fame; and the first United States Mint is on Seventh Street above Market. The Pennsylvania Historical Society, one of the strongest organizations of its kind in the country, has a finely equipped, fireproof building at Thirteenth and Locust streets.

Philadelphia's recent business structures will compare favorably in size and importance with those of any other American city. Among the leading office buildings may be mentioned the Land Title and Trust Building Annex (319 feet high), the pioneer Betz Building, the Real Estate Trust Building, the Arcade Building, the Commonwealth Trust Building, the Widener Building, and the magnificent Girard Trust Building (a copy of the Pantheon), all grouped around the City Hall. The Drexel Building, the Bullitt Building, and the Provident Building are notable structures of the financial area. In this vicinity, also, is the Philadelphia Contributionship "Hand in Hand," the oldest fire insurance company in America, of whose directorship Franklin was an early member. The Pennsylvania Railroad Station, with a train shed over 590 feet long, and the Reading Terminal, a handsome railway station, approached like that of the Pennsylvania Railroad by a viaduct, are notable railway terminals and office headquarters. Of newspaper buildings the most prominent are those of the *North American* (22 stories), the *Evening Bulletin*, the *Record*, and the *Public Ledger*. The *Ladies' Home Journal*, the *Saturday Evening Post*, and the *Country Gentleman* are housed in the magnificent Curtis Building, facing Independence Square. The building of the old Lippincott Publishing House is on Washington Square. Of semipublic organizations there are the Stock Exchange; the Bourse Building, the home of the Board of Trade, the Trades League, and other trade organizations; and the Commercial Museum, supported by municipal, State, and Federal appropriations and devoted to the encouragement of foreign commerce, especially with Spanish America, is located in the former Export Exposition Building in West Philadelphia, on the site of the Exposition of 1899. Philadelphia has many important hotels; among the most elegant and commodious of these structures may be mentioned the Bellevue-Stratford, the Ritz-Carlton,



with three distinct courses—academic, manual training, and commercial. The basis of the courses is uniform throughout the city except where modified to meet the demands of the community. The Central High School for Boys, founded in 1837, is vested with the power of conferring degrees. The Normal School prepares women, and the School of Pedagogy prepares men, for the profession of teaching. The problem of vocational education centres in the work of the Philadelphia Trades School for Boys. Manual training forms a part of the course for boys and sewing and cooking for girls in the seventh and eighth grades of the elementary course. Backward children and truants are cared for in special schools. In 1915 there were enrolled in the higher schools 15,640 pupils, and in the elementary schools 173,450 pupils. The teaching staff was made up of 5339 officers and teachers, 653 of whom were in the higher schools. The system is designed to give a complete course of instruction, from the kindergarten to the university. The city maintains a complete system of elementary and higher evening schools for men and women, including evening trade schools. The work of the day and evening schools is supplemented by the work done in the summer season in the 22 playground centres under direction of the board of recreation. Through private bequest and municipal legislation there are available 325 free scholarships in the University of Pennsylvania, Bryn Mawr, Lehigh University, and various medical, art, and scientific colleges. The Roman Catholic church maintains an independent system of elementary and higher schools.

At the head of the higher educational institutions is the University of Pennsylvania (q.v.). Philadelphia is a centre of medical education, its prominent medical colleges being those of the University of Pennsylvania, Jefferson, Hahnemann, Medico-Chirurgical, Polyclinic, and Woman's (founded in 1850), the first chartered medical college for women in the world to confer the degree of M.D. The Philadelphia dental college, the dental department of the University of Pennsylvania, the dental school of the Medico-Chirurgical College, and the Philadelphia College of Pharmacy are largely attended. The schools of the Pennsylvania Academy of the Fine Arts (founded in 1805) are the oldest in the country. The Pennsylvania Museum and School of Industrial Art and the School of Design for Women are well known. Bryn Mawr College (q.v.), near Philadelphia, is one of the foremost women's institutions of the United States. The Drexel Institute, founded and endowed with \$2,000,000 by A. J. Drexel, offers at a small cost courses in art, sciences, and industrial training. Other leading institutions are the Franklin and Spring Garden institutes, Pennsylvania institutes for the blind and for the deaf and dumb, Temple University, Episcopal Academy, the seminaries of the Protestant Episcopal, Lutheran, and Roman Catholic churches, La Salle and St. Joseph's colleges, numerous schools of the Society of Friends, including the William Penn Charter (1701, the first chartered school in the country), and the Germantown Academy (1760). The Williamson Free School of Mechanical Trades, located at Williamson, in Delaware County, established under a bequest of \$2,500,000 by the late I. V. Williamson, offers complete trade

courses and supports students free of cost. At the head of the list of institutions for the promotion and diffusion of science and learning stands the American Philosophical Society, with its reference library, containing more than 50,000 volumes and some rare manuscripts, founded in 1743 as the outgrowth of the "Junto." It was early made famous by Franklin, Rittenhouse, the great astronomer, and Godfrey, the inventor of the mariner's quadrant. Among its members are found many of America's noted scholars and men of affairs. The home of the society is on South Fifth Street near Independence Square. Other important institutions are the Philadelphia Academy of Natural Sciences (q.v.), the American Academy of Political and Social Science, the Historical Society of Pennsylvania, the Zoölogical Society, the Numismatic and Antiquarian Society, and the Wagner Institute.

The Free Library of Philadelphia was chartered in 1891, on bequests by George S. Pepper and others, and is maintained by appropriations made by city councils. Its buildings include a main library, occupying temporary quarters at Thirteenth and Locust streets, and 25 branches scattered throughout the city. Of these 17 have been erected out of a gift by Andrew Carnegie of \$1,500,000 for 30 branch buildings. A site of two acres in extent on the Parkway, at Nineteenth and Vine streets, has been acquired by the city, on which it is proposed to erect a main library building. The collection consists (1915) of 510,728 volumes and 214,188 pamphlets, and the total circulation for 1914 was 2,542,137 volumes. The Library Company's collection, begun in 1731 by Benjamin Franklin and his associates of the "Junto," formed the first subscription library in America. Its 200,000 volumes include many of extreme rarity. The Ridgway Branch, an excellent example of pure Greek architecture, contains one of the most valuable reference lists in the United States. It includes also the Loganian Branch, founded by James Logan in 1699. Other important libraries of the 100 in the city are the Mercantile (1821), general circulation and reference; Carpenters' Company (1736), architecture and building; Friends' (1742); American Philosophical Society (1743); Hurst, law; College of Physicians; University of Pennsylvania, Apprentices', Pennsylvania, Presbyterian, and Baptist Historical societies; Drexel Institute; and the H. Josephine Widener Branch of the Free Library, with a valuable collection of reference works.

Hospitals and other Institutions. The municipal charities are the hospitals for the indigent and for the insane, General Hospital, and the Municipal Hospital (contagious diseases). The Pennsylvania Hospital, located at Eighth and Spruce streets, was founded in 1751, through the efforts of Franklin, and maintained entirely by private subscription, and is the oldest institution of the kind in America. The religious denominations maintain institutions, among them being St. Agnes', St. Mary's, and St. Joseph's hospitals (Roman Catholic); Episcopal, Methodist, Presbyterian, Jewish, St. Luke's and Samaritan (Baptist), and German (Lutheran) hospitals. Large hospitals are connected with the university and Jefferson, Medico-Chirurgical, Polyclinic, Hahnemann, and Woman's Medical colleges. Other important charities are the Rush and Phipps hospitals for consumptives,

the Gynæcean, Orthopædic, Wills's, Eye, and Maternity hospitals. There are more than 100 dispensaries, homes, asylums, orphanages, etc. The College Settlement, Society for Organizing Charity, Working Women's Guilds, Flower, Fruit, and Ice Mission, various children's aid, protection, and country-week associations do good work. The city maintains 22 public bath-houses, which are patronized annually by over 5,000,000 persons.

Girard College, founded by Stephen Girard, who at his death in 1830 gave \$2,000,000 for construction and the greater portion of his \$5,000,000 estate for endowment, supports and educates annually over 1556 orphans at a cost of \$706,000 (\$454 each). The residuary fund now amounts to \$31,355,379, which is administered by the board of city trusts. The citizens' permanent relief committee, of which the mayor is president, has relieved thousands of distressed persons in all parts of the world, more than \$6,000,000 having been distributed since 1879. The penal institutions are the Eastern State Penitentiary, the House of Refuge at Glen Mills (boys and girls), the House of Correction (adults), and Moyamensing and Holmesburg County prisons.

Theatres and Clubs. The drama in America began in Philadelphia, a company being organized here in 1749. The first permanent playhouse in the city was built in 1766; a portion of its walls still stands. The Walnut Street Theatre is the oldest in the country. At Locust and Eighth streets stands the Musical Fund Hall, where Malibran, Jenny Lind, and Ole Bull appeared. Other important playhouses are Keith's Theatre, the Garrick, the South Broad, the Chestnut Street, the Little Theatre, the Forrest, the Adelphi, the Lyric; the Metropolitan, the Grand, and Chestnut Street opera houses. The Academy of Music, with a capacity of 2900, and the Horticultural Hall adjoining it, are used for large public gatherings. The Metropolitan Opera House, which has a seating capacity of 4000, is the home of grand opera in Philadelphia.

Leading clubs are the Union League (with a handsome brownstone building), Philadelphia Manufacturers', Mercantile, Rittenhouse, Markham, University, Columbia, the Art (installed in a beautiful Renaissance structure of Pompeian brick and Indiana limestone), Penn. Lawyers', Clover, Five o'Clock, Maennerchor, Philadelphia Country, Manheim, Pen and Pencil, Philadelphia Yacht, New Century, Acorn (women's), Sketch, Franklin Inn, Poor Richard, Plastic, and Le Coin d'Or. The "State in Schuylkill," founded in 1732, is the oldest club in America. The City Club, an organization for the study of civic problems, has 2000 members.

Commerce and Manufactures. The industrial development of Philadelphia has been greatly aided by the favorable location of the city for commerce and especially by its proximity to raw materials. The city has the advantage of superior railroad facilities. The great Pennsylvania Railroad system, with 11,794 miles of owned and leased lines, and the Philadelphia and Reading Railway, with \$140,000,000 capital and 1457 miles of track, terminate and have some offices near the City Hall. The Pennsylvania lines give Philadelphia more direct communication with the productive Middle West than is enjoyed by any other Atlantic port. The Baltimore and Ohio enters

where Chestnut Street crosses the Schuylkill. The tracks of the Pennsylvania are nearly all elevated or below grade, the Baltimore and Ohio below, and the Reading partly above, partly below, but mainly at grade. The Delaware River admits of the entrance of ocean vessels and is navigable the entire length of the city's frontage (37 miles). Work is now in progress to deepen the river to 35 feet. The Schuylkill River is navigable 8 miles for vessels of light draft and is being dredged to a depth of 22 feet. The general export and import interests, including the Port Richmond coal wharves, are located mainly on the Delaware. Twenty-one transatlantic lines enter the port.

Early in the nineteenth century Philadelphia was first among United States ports in foreign commerce, but its relative importance declined, until in 1913 it ranked fifth. The imports for that year were valued at \$91,934,112 and the exports at \$72,422,585. In 1914, 419 sailing vessels, with an aggregate of 434,799 tons, and 2583 steam vessels, foreign and coastwise, with a tonnage of 7,305,644, entered the port. The pipe lines of the Standard Oil Company from the wells in the northwest section of the State terminate at Point Breeze on the Schuylkill, and oil is one of the largest and most valuable shipments. In 1913 the exports of illuminating mineral oil amounted to 315,577,029 gallons, valued at \$23,317,034. Wheat and flour are also exported extensively, 7,164,386 bushels of wheat, aggregating \$6,836,325 in value, and 1,172,242 barrels of flour, valued at \$6,123,990, being exported in 1913. There were also considerable exports of meat and meat products. Coal and copper are other important exports. The largest import is sugar, amounting in 1913 to a value of \$9,037,896. Among other leading imports are goat skins (\$5,770,201), fabrics, bananas, etc.

Philadelphia is a great manufacturing centre, ranking third in the United States in value of products. In the production of steam locomotives, street-railway cars, iron and steel, knit goods, carpets and rugs, leather, saws, felt hats, upholstery goods, and oilcloth, Philadelphia is unequaled by any other city in America. The city is second in foundry and machine-shop products, sugar refining, petroleum refining, worsted goods, chemicals, druggists' preparations, dyeing and finishing textiles, cordage, twine, and fertilizers. The value of the total output in 1909 was \$1,363,060,000, nearly double the corresponding figure for 1900. The refining of sugar and molasses is the most important industry, according to the value of the products, \$37,600,000. The manufacture of locomotives is a very important industry. The Baldwin Locomotive Works has a yearly capacity of 2500, aggregating in value \$42,000,000. For years Philadelphia has been the foremost shipbuilding centre in the country. Many warships of the United States and also a number for foreign governments have been built at the Cramp shipyard, which occupies about 52 acres in the Port Richmond section. These two establishments are not only the leading ones of Philadelphia, but each excels in its own line for the country at large. In the total manufacture of textiles also the city ranks first (though not for any one branch), the value of the principal textiles produced in 1914 being as follows: woolen and worsted goods, \$54,900,000; cotton goods, \$22,500,000; hosiery and knit goods,

\$23,900,000. The value of the foundry and machine-shop products was \$38,600,000; the output of clothing, \$59,100,000; of carpets and rugs, more than \$22,600,000; of leather, nearly \$24,000,000; and of malt liquors, more than \$14,200,000.

Philadelphia is the seat of the Federal Reserve District No. 3, having 628 member banks. Its territory embraces the eastern two-thirds of Pennsylvania, the southern half of New Jersey, and all of Delaware. The capital subscribed is \$10,527,500, with a paid-in capital of \$5,263,750.

Government. The executive branch of the government is dual, consisting of county and municipal departments. The municipal form of government is provided for by the Bullitt Bill, Act of June 1, 1885, amended April, 1903, June, 1909, and May, 1913, the basic elements of which are concentration of authority in the mayor and the distinction between the executive and legislative functions. The executive departments are: public safety, which includes bureaus of police, fire, electricity, corrections, boiler inspection, building inspection, and elevator inspection; public works, which includes bureaus of water, city property, highways, gas, lighting, and surveys; public health and charities; wharves, docks, and ferries; city transit; law; revision of taxes; receiver of taxes, city controller, and city treasurer (ex-officio county treasurer), and supplies. The mayor, who is elected once in four years and is ineligible for succession, appoints directors of the departments of public works, public safety, public health and charities, and supplies, wharves, docks, and ferries, city transit, subject to confirmation by select council. Directors appoint chiefs of bureaus and other employees under civil-service requirements. The receiver of taxes, city treasurer, city controller, and city solicitor are elected by popular suffrage. The board of public education consists of 15 members, appointed by the judges of the courts of Common Pleas. The board of public education is not a department of the city government. It has entire control of the schools and is empowered by the State School Code to lay and collect a school tax not exceeding six mills. The sinking fund commission consists of the mayor, city controller, and one member elected by councils. The commissioners of Fairmount Park and members of the board of revision of taxes, and the board of city trusts, in charge of Girard College and estate and minor trusts, are also appointed by the courts. The county officials are commissioners in charge of elections, etc., treasurer, recorder of deeds, register of wills, clerk of the Court of Quarter Sessions, coroner, sheriff, and district attorney. The legislative function is exercised by select and common councils, the former consisting of one member from each of 42 wards, the latter of one member for every 4000 voters. Select councilmen serve four years, and common councilmen two, without pay. The veto power is vested in the mayor, a three-fifths vote enacting over it. The judiciary consists of police magistrates (limited civil and preliminary criminal actions); judges of the courts of Common Pleas (civil), who are also judges of the courts of Quarter Sessions (criminal); judges of the Orphans' Court (estates); and judges of the Municipal Court (with juvenile and domestic-relations divisions). The Superior and Supreme courts of Pennsylvania and the United

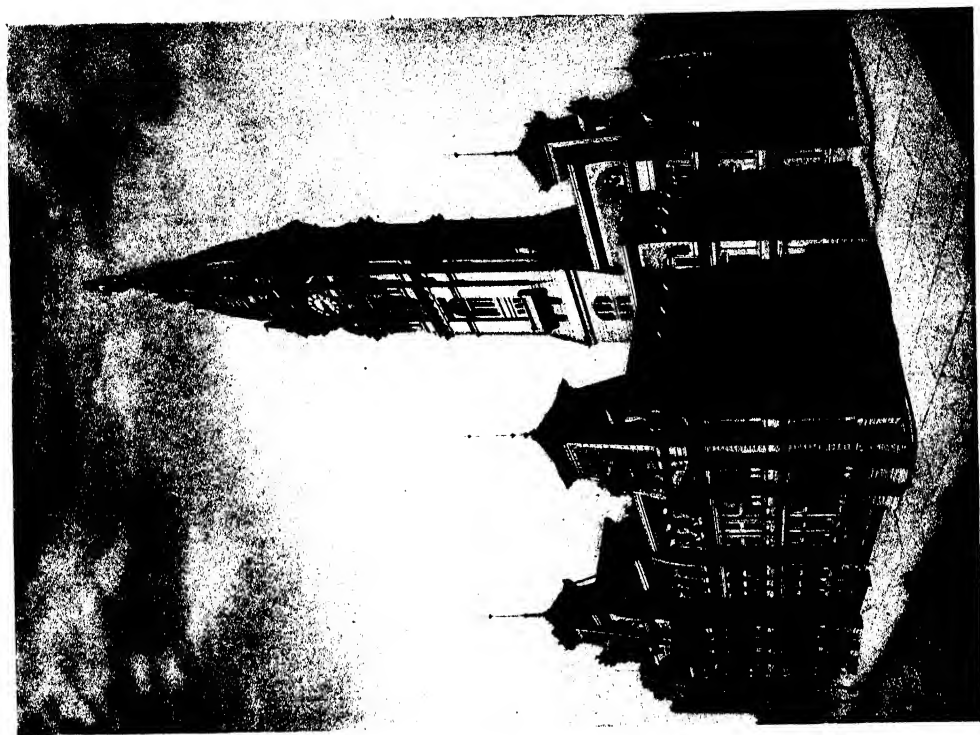
States District and United States Circuit courts sit in the city.

The lighting of the city is done by 24,319 gas lamps, which are supplied by the lessees of the Philadelphia Gas Works free of cost to the city, 19,097 naphtha incandescent lamps and 14,619 electric arc lights, supplied by private corporations. The water works are under municipal ownership and consist of 9 pumping stations, 52 pumps, and 16 reservoirs. The water is distributed through 1783 miles of pipe, and 17,415 fire hydrants are provided for fire protection. The city has 50 miles of water pipe on high-pressure service. The complete works, with a daily capacity of 382,000,000 gallons, are estimated to cost \$75,000,000. Since the completion of the filtration system Philadelphia has enjoyed a supply of pure water. The standard of purity is kept higher than the standard set by the Bureau of Standards of the United States Government. It is also higher than the standards set by the most advanced European cities. The death rate from typhoid fever has been reduced to eight per hundred thousand.

Finances. The city's receipts for 1914 were \$32,536,665. The important items were: taxes, \$14,932,417, gas, \$1,953,342, personal-property tax, \$2,249,410; permits, fees, etc., \$9,347,115, including water rents, \$4,215,617. The expenditures were \$32,348,054; the largest item was \$17,939,741 for municipal departments and bureaus; police, \$4,065,574, fire, \$1,317,547; water, \$1,331,262; highways, \$3,452,778; electrical bureau, \$1,696,556. Other large disbursements were: interest on funded debt, \$8,774,802; several sinking funds, \$8,978,128; mandamus, \$6,803,347. The general cash balance on Jan. 1, 1914, was \$3,516,343. The gross debt at the same date was \$117,686,850; the city loans held by the sinking fund amounted to \$19,769,500, leaving a net city debt of \$97,917,350, the total assets were \$22,230,052, not including the real estate owned by the city, valued at \$319,148,733. The assessed real-estate valuation, subject to taxation, as estimated in June, 1915, was \$1,669,891,999. The assessed personal-property valuation was \$582,896,468. Under the law the debt is limited to 7 per cent. All permanent loans after the 2 per cent point has been exceeded must be authorized by a vote of the people. Expenses incurred by the board of public education for 1914 were \$8,377,953.

Population. The population in 1910 was 1,549,008, Philadelphia ranking third among American cities. Since 1854 no territory has been added to the municipal limits. The percentage of increase from 1880 to 1890 was 23.58, from 1890 to 1900, 23.57, and from 1900 to 1910, 19.70. Of the white population 61.9 per cent is of foreign parentage, but native whites of foreign parentage comprise 32 per cent of the entire population. The negroes numbered 84,549 in 1910; Chinese, Japanese, and Indians, 1177. The largest classes of European descent are Irish, German, Russian, English, and Italian. French, Greeks, Armenians, Hungarians, Bohemians, and Poles are present in lesser numbers. Though some tendency to congregate is shown, there are few well-defined foreign colonies. In 1800 the population of Philadelphia was 23,522; in 1820, 63,802; in 1840, 93,665; in 1860, 563,529; in 1880, 847,170; in 1900, 1,293,697; in 1910, 1,549,008; in 1914 (census est.) 1,657,810.

History. The first settlement (called Wicaco) within the present limits of Philadelphia was



CITY HALL



INDEPENDENCE HALL

PHILADELPHIA

made in 1636 by a company of Swedes sent out by the government of Queen Christina. On Oct. 7, 1681, Capt. William Markham, Deputy Governor for William Penn, arrived with a small company and organized an English settlement here, which in July of the following year was laid out and called Philadelphia (the city of brotherly love). In 1683 a company of Germans, under the leadership of the scholarly Pastorius, invited hither by Penn, arrived and settled at Germantown, within the present city limits. In 1684, immigration having been rapid from the beginning, there were 300 houses and more than 2500 inhabitants. The greater part of the early settlers were Friends, and their influence, combined with that of the Germans, predominated for many years and greatly affected the course of Pennsylvania's history. In the early part of the eighteenth century the tide of immigration set in from Scotland and Ireland. By the time of the outbreak of the Revolution the Scotch-Irish gained the balance of political power. Throughout the Revolutionary period they shaped the political policies of the Middle Colonies. Penn returned to England in 1684 and did not revisit the city until 1699, when he found a population of 4500 and 700 houses. He chartered the city in 1701, and thereafter frequent controversies arose between the people and the Penn family over proprietary privileges, especially regarding taxation of the Penn lands. The first English school was opened in 1683. Franklin's *Pennsylvania Gazette* began publication in 1729, and the *Pennsylvania Journal and Weekly Advertiser* was begun in 1742. In 1741 the city, then having 1621 taxable citizens, was divided into 10 wards. In 1723 Benjamin Franklin, who, next to Penn, exerted the greatest influence in the history of the city, came to Philadelphia. In 1747, during King George's War with the French and the Indians, the publication of his *Plain Truth* roused a spirit of military enthusiasm; a force of 10,000 was raised in Pennsylvania, and a battery was erected below the city, on the site of the present United States Navy Yard. In 1751 the first line of packets to New York was established, followed in 1756 by a stage line. Under Franklin's influence, in 1747 the merchants of Philadelphia sent a ship to discover the Northwest Passage. In 1755 a militia bill was passed, and Franklin became colonel of the city regiment.

From 1763 to 1774 Philadelphia was prominent in resisting British aggression, though the Loyalist party was strong and most of the Friends opposed warfare; and here most of the important official events of the Revolution took place. In 1773 (October 17), during the excitement over the expected arrival of the tea ship *Polly*, the people met in mass meeting and passed resolutions which on November 5 were re-adopted at Boston. The first Continental Congress met in Carpenter's Hall, Sept. 5, 1774; the second met May 10, 1775, in the State House. Philadelphia was held by the British from Sept. 27, 1777, to June 18, 1778, and during this period, while the American army was at Valley Forge, the city was the scene of much gayety. On May 18, 1778, the famous entertainment called the *Mischianza* (q.v.) was given in honor of General Howe, who was about to depart for Europe. On Oct. 4, 1777, the battle of Germantown (q.v.) was fought. On May 14, 1787, delegates from the different States met

here and, after almost four months of debate behind closed doors, adopted, September 17, a Constitution for the United States. On March 11, 1789, the city received a new charter from the Legislature. Epidemics of yellow fever in 1793 and 1798 caused great loss of life, at least 4000 dying in the former year and almost 5000 out of the 30,000 who remained in the city in the latter.

During the latter part of the eighteenth century and the early part of the nineteenth Philadelphia was the most important city in America. The historian McMaster says of it in 1784: "The city was then the greatest in the country. No other could boast of so many streets, so many houses, so many people, so much renown"; and Liancourt describes it in 1800 as "not only the finest city in the United States, but . . . one of the most beautiful cities of the world." Philadelphia was the capital of Pennsylvania from 1683 until 1790, the seat of the Federal government from 1790 to 1800, and the monetary centre of the country until 1836. (See BANK, BANKING.) For many years, also, it was the intellectual and literary centre of the country. Here were published the first newspaper in the Middle Colonies, the *American Weekly Mercury* (1719); the first secular magazine in North America, *Ein geistliches Magazin* (1764); the first daily newspaper in the United States, the *Pennsylvania Packet* (1784); the first American edition of the Bible in German (1743) and in English (1781), and the first religious weekly, the *Religious Remembrancer* (1813). The most popular of the early American magazines—the *Port Folio* and the *Analec-tic*—also were published here.

Philadelphia took the lead in the early anti-slavery movement, the first formal protest against slavery in this country being made by four Germans of Germantown in 1688, the first Abolition convention being held here Jan. 1, 1794, on the invitation of the Pennsylvania Abolition Society, and the American Antislavery Society being founded here, under the leadership of Garrison, in 1833. In 1812 the water works at Fairmount were begun and were finished in 1815. In 1832 nearly 1000 deaths resulted from Asiatic cholera. In May, 1838, an anti-Abolitionist mob destroyed Pennsylvania Hall, in which an Abolitionist meeting had just been held. In 1844 occurred the anti-Catholic riots, arising from the demand of the Catholics to be permitted to use the Douai instead of the King James Bible in the public schools. The anti-Catholics, or "Native Americans," burned St. Michael's and St. Augustine's churches and caused much loss of life before they were put down by the militia. Gas was introduced in 1836, and the first telegraph line was established in April, 1846. On Feb. 2, 1854, a consolidation act was passed by the Legislature, extending the city limits to the county boundaries and uniting under one municipal government all the outlying districts, known as Southwark, Northern Liberties, Kensington, Spring Garden, Moyamensing, Penn, Richmond, West Philadelphia, and Belmont; also the boroughs of Germantown, Manayunk, and some outlying townships. The names of the boroughs and townships included in the Consolidation Act of 1854 are commemorated in the elaborate bronze lamp-posts on City Hall Plaza. Philadelphia took an active part in the Civil War and raised more than \$1,000,000

by a sanitary fair in 1864. The centenary of American independence was celebrated in 1876 by the Centennial Exposition, the bicentennial of the landing of William Penn in 1882, and the centennial of the signing of the Constitution in 1887. In 1908 the Historical Pageant Association celebrated the two hundred and twenty-fifth anniversary of the founding of the city.

Bibliography. D. W. Belisle, *History of Independence Hall* (Philadelphia, 1859); Samuel Hazard (ed.), *Watson's Annals* (ib., 1884); Scharf and Westcott, *History of Philadelphia, 1609-1884* (3 vols., ib., 1884); G. E. Vickers, *Philadelphia: The Story of an American City* (ib., 1893); Young, *Memorial History* (ib., 1895); S. G. Fisher, *The Making of Pennsylvania* (ib., 1896); id., *Pennsylvania: Colony and Commonwealth* (ib., 1897); Talcott Williams, "Philadelphia," in L. P. Powell (ed.), *Historic Towns of the Middle States* (New York, 1899); L. I. Rhoades, *The Story of Philadelphia* (ib., 1900); Moses King (ed.), *Philadelphia and Notable Philadelphians* (ib., 1902); S. F. Hotchkiss, *Penn's Greene Country Towne* (Philadelphia, 1904); Lawrence, *History of Philadelphia. Almshouses and Hospitals* (ib., 1905); E. P. Oberholtzer, *Literary History of Philadelphia* (ib., 1906); Agnes Repplier, *Philadelphia: The Place and the People* (new ed., New York, 1907); H. D. Eberlein, *Colonial Houses of Philadelphia and its Neighbourhood* (Philadelphia, 1912); J. J. Macfarlane, *Manufacturing in Philadelphia, 1683-1912* (ib., 1912); Elizabeth Pennell, *Our Philadelphia* (ib., 1914).

PHILADELPHIA ACADEMY OF NATURAL SCIENCES. An association founded in 1812 for the purpose of furthering the study of the natural sciences and encouraging original investigation in the various fields of physical research. Its museum is especially rich in ornithological specimens and fossils, and its collection of shells is the finest in the world. The library contains about 80,000 volumes and is especially rich in the transactions of learned societies. The Jessup Foundation provided gratuitous training for a number of young investigators. The society has published a *Journal* since 1817 and its *Proceedings* since 1841.

PHILADELPHUS (Neo-Lat., from Gk. *φιλᾶδελφος*, *philadelphos*, sort of flowering shrub, perhaps jasmine; named in honor of Ptolemy Philadelphus, King of Egypt). A genus of shrubs of the family Saxifragaceæ. Several species are natives of the Southern Atlantic and Pacific States and Japan. *Philadelphus inodorus* grows in the mountains from Virginia southward. *Philadelphus grandiflorus* grows in lower ground in the same region. *Philadelphus hirsutus* ranges from North Carolina to Alabama in the mountains. *Philadelphus gordonianus* and *Philadelphus lewisii* are natives of the Pacific Coast States. The most common and best representative of the genus, however, is *Philadelphus coronarius*, the common mock orange or syringa, much cultivated in gardens. Its native country is not known, but it was probably brought from Japan to southern Europe, where it appears to be thoroughly established. It has erect branches, oblong-ovate leaves, which when crushed have very much the odor and taste of cucumbers. Its creamy-white flowers, borne in large clusters, are well known for their exceeding fragrance.

PHILÆ (Lat., from Gk. *Φιλᾶ*, Coptic *Φιλᾶ*, *hēh*, the corner, extremity, i.e., of Egypt). A celebrated island in the Nile, just above the First Cataract, in lat. 24° 1' N. It is a small granite rock, about 1000 feet long by 500 feet broad, and is covered with ancient buildings of great architectural beauty and interest. By the Arabs it is called *Gezret Anas el Wogūd* (the island of Anas el Wogūd), from the name of the hero of a tale in the *Thousand and One Nights*, the scene of which is laid here. Philæ is not mentioned in the Egyptian inscriptions before the time of Nectanebo II (361-343 B.C.), who constructed the oldest of the buildings that now remain, though it is reasonably certain that a temple existed there in earlier times. The island was especially devoted to the worship of the goddess Isis, but Osiris, Hathor, Khnum, Satet, and other divinities also were worshipped there. In later times, when the cult of Isis had spread through the Greek and the Roman world, many pilgrims of foreign nationality visited the shrine of the goddess at Philæ, and her worship was maintained there long after heathenism had been banished from other parts of Egypt. The great temple of Isis was built by Ptolemy Philadelphus and his successor, Euergetes I, but additions and embellishments were made by other Ptolemies and by several of the Roman emperors, constituting an ensemble of late Egyptian architecture of extraordinary splendor. The approach to the temple is formed by the dromos, a long open space, flanked on its eastern and western sides by colonnaded walks. At the southern end is the hall of Nectanebo II, built about 350 B.C., and near it to the right is the ruined temple of the Nubian deity Arnuphis (Ar-hes-nofer). Beginning from this temple, the eastern colonnade runs northward to the small temple of Imhotep (Asklepios) and terminates near a gate built by Ptolemy Philadelphus, which is adorned with reliefs by that monarch and by the Emperor Tiberius. The western colonnade is pierced by a number of windows which give a good view over the river. It runs along a fine stone quay of ancient construction. At the northern end of the dromos stands the great pylon of Nectanebo II, leading into the outer court, on the eastern side of which are a number of chambers, built for the use of the priests; and on the western side is the birth house, commemorating the birth of Horus. On the walls of the latter building is a copy in hieroglyphic demotic of the text of the Rosetta stone (q.v.). At the upper end of the outer court is a second pylon, which gives entrance to the inner court leading to a hypostyle hall, and from this, through a succession of smaller halls and chambers, to the sanctuary of the goddess Isis and her son Harpocrates (q.v.). In an upper story is a room decorated with scenes from the myth of Osiris (q.v.). The temple is decorated throughout with sculptures and reliefs, which are richly colored and well preserved. West of the temple of Isis, near the river, is a gate built by the Emperor Hadrian and also the temple of Harendotes (Egypt. *Har-nez-yotf*, Horus the avenger of his father). On the eastern side of the island is the small temple of Hathor, built by Ptolemy Philometor and Euergetes II, and near it, close to the river bank, is a beautiful pavilion supported by light and graceful columns, richly adorned with reliefs, popularly known as "Pharaoh's Bed." On the

northern end of the island, among the ruins of the ancient city of Philæ, are the remains of the old Roman city gate, of the temple of Augustus, and of a Coptic church. Since 1903 the completion of the great dam at Assuan (q.v.) has so raised the level of the Nile at Philæ as to submerge the island, except from July to October, when the river is allowed to run freely through the sluices of the dam.

Bibliography. *Description de l'Égypte*, edited by F. Jomard (9 vols., Paris, 1809-22); C. R. Lepsius, *Reiseberichte aus Aegypten* (Leipzig, 1855); Alphonse Mariette, *Monuments of Upper Egypt* (Eng. trans., London, 1877); Johannes Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878); Alphonse Mariette, *Voyage dans la Haute-Égypte* (2d ed., Paris, 1893); H. G. Lyons, *A Report on the Island and Temples of Philæ* (Cairo, 1896), containing many photographs and plans; A. B. Edwards, *One Thousand Miles up the Nile* (new ed., London, 1899); H. G. Lyons, *A Report on the Temples of Philæ* (1908); Baedeker, *Egypt* (7th Eng. ed., Leipzig, 1914). See Plate accompanying EGYPTIAN ART.

PHILANDEER. A Dutch knight in Ariosto's *Orlando furioso*, who made love to Gabrina, the wife of his host. His name is used as the synonym of a male coquet in various plays, and is the origin of the verb to philander (to play at love).

PHILANDER SMITH COLLEGE. A co-educational institution for higher education, founded at Little Rock, Ark., in 1877. It is under Methodist Episcopal control. It includes the college, academic department, commercial department, music department, and grammar school. The value of the college grounds and buildings is about \$170,000, and the annual income from all sources is \$120,000. The total enrollment in all departments in 1915 was 491, and instructors numbered 25. A new dormitory for girls, Webb Hall, was completed in 1915. The library contains about 3000 volumes. The president in 1915 was the Rev. J. M. Cox, D.D.

PHILANTHROPY (Lat. *philanthropia*, from Gk. *φιλανθρωπία*, love of humanity, from *φιλάνθρωπος*, *philánthros*, loving humanity). In German educational history, a term applied to the theories of a group of men who based their educational theories upon the teachings of Rousseau. At the head of these was Basedow, who founded an institution, the Philanthropinum, at Dessau in 1774. The only survival of the movement is Salzmann's institution at Schnepfenthal in Gotha, founded in 1784. Consult B. K. Gray, *A History of English Philanthropy* (London, 1905). See BASEDOW.

PHILARET, fé'lá-rét (VASILI MICHAËLOVITCH DROZDOV) (1782-1867). Metropolitan of Moscow. He was born at Kolomna, became a priest in 1808, and in 1812 was made rector of the Theological Academy of St. Petersburg. In 1817 he became Bishop of Revel, in 1819 Archbishop of Tver and a member of the Holy Synod. In 1820 he was transferred to Yaroslavl and in 1821 to Moscow. He received the appointment of Metropolitan of Moscow in 1825. He was noted for learning and eloquence, and drew up the manifesto which led to the abolition of serfdom. He prepared a longer and a shorter catechism, both of which were adopted and promulgated by the Holy Synod in 1839, and the former is considered the most authoritative

doctrinal standard of the Græco-Russian church. Both catechisms have been translated into English by Blackmore in *The Doctrine of the Russian Church* (London, 1845); Blackmore's translation of the longer catechism is reprinted in Schaff, *The Creeds of Christendom*, vol. ii, pp. 445-542. A volume of Philaret's *Select Sermons* in English translation has also been published (London, 1873), with a brief biography. He began a translation of the New Testament into Russian, completed after his death.

PHILASTER; OR, LOVE LIES A-BLEEDING. A tragedy by Beaumont with some assistance from Fletcher; one of the best known of their joint plays. It was produced not later than 1611 (as John Davies alludes to it in his *Scourge of Folly*) and was printed in 1620. Among several versions produced one by Colman was played in 1764.

PHILATELIC (fil'á-tel'ík) **SOCIETY**, **AMERICAN** (from Gk. *φίλος*, *philos*, loving, from *φιλεῖν*, *philein*, to love + *τέλος*, *telos*, free of tax, prepaid, from *α-*, *a-*, not + *τέλος*, *telos*, tax, duty). A national society of postage-stamp collectors, founded in 1886, meeting annually in such cities as may be selected and having local branches in Chicago, San Francisco, Cleveland, Detroit, Buffalo, Richmond (Va.), Omaha (Neb.), Saginaw (Mich.), Los Angeles, Berkeley (Cal.), Louisville (Ky.), Columbus (Ohio), St. Louis, Pittsburgh, Philadelphia, Springfield (Mass.), Baltimore, Rochester (N. Y.), and Honolulu (Hawaii). It has a membership exceeding 1400, living principally in the United States, but with many members in all parts of the world. Its objects are to bring together those interested in philately and to study that subject through the aid of exhibitions of stamps and the association of its members. It conducts various departments having in view the benefit of its members. It was organized Sept. 14, 1886, and was incorporated under the laws of the State of Minnesota, April 3, 1897. Its affairs are under the management of a board of nine directors, elected annually. The society publishes its own official journal, the *American Philatelist*, issued semimonthly and sent free to all members. In addition it issues handbooks relating to stamp collecting.

PHILATELIC SOCIETY OF LONDON. An English association of collectors of postage stamps, founded in London in 1869, the first of its kind. Its objects are the study of postage stamps, their history and manufacture, the detection of forgeries, the exhibition of stamps, and the publication of works on these subjects. The membership includes many collectors in the English colonies and on the Continent. The society has conducted two international philatelic exhibitions. It has also published expensive volumes on the stamps of Great Britain, of the British colonies, of India and Ceylon, and of Africa, and issues its proceedings in the *Monthly Journal*.

PHILATELY. See POSTAGE STAMPS.
PHILBRICK, JOHN DUDLEY (1818-86). An American educator, born in Deerfield, N. H. He was graduated at Dartmouth College in 1842 and afterward taught in Boston for 10 years. In 1853 he became principal of the Connecticut Normal School and in 1855 superintendent of schools in that State. From 1857 to 1874 and again from 1876 to 1878 he was superintendent of the Boston public schools. He was sent to the Vienna Exposition of 1873 as educational

commissioner from Massachusetts, and acted as a member of the international jury. After his return he became president of the National Teachers' Association and was officer of many educational societies. He prepared a valuable report on *City School Systems in the United States* (published by the United States Bureau of Education in 1885) and edited the *Connecticut Common School Journal* and the *Massachusetts Teacher*.

PHILEMON (Lat., from Gk. Φίλων) (c.361-283 B.C.). A Greek comic poet, a native of Soli in Cilicia or of Syracuse in Sicily. He resided chiefly in Athens, but for a time also in Alexandria at the court of Ptolemy Philadelphus. He and Menander were the two representative poets of the Attic New Comedy. Philemon gained more prizes than Menander. Posterity, however, reversed the decision, and Menander and Homer were the two favorite poets of later Greece. Of the 97 comedies of Philemon 57 are known to us from titles and fragments, while two at least, the *Ευροπος* and the *Θυραυρὸς*, are preserved in Plautus's adaptations, the *Mercator* and the *Trinummus*; and it is probable also that Plautus's *Mostellaria* follows Philemon's *Φάσμα*. The fragments were published by Koch, *Comicorum Atticorum Fragmenta*, vol. ii (Leipzig, 1886). In 1902 a new fragment of Philemon was found by Grenfell and Hunt and published in *The Hibeh Papyri*, part i (Oxford). Consult C. A. Dietze, *De Philemone Comico* (Göttingen, 1901).

PHILEMON. A friend beloved of the Apostle Paul, to whom he wrote the letter which is now preserved in the New Testament under Philemon's name. From this letter it appears that he was a rich man who probably lived at Colossae, owned slaves, was noted for his hospitality, and had become a Christian under Paul's influence. There are legendary accounts of Philemon's later accession to the bishopric of Colossae and of his martyrdom there under the Emperor Nero.

PHILEMON, EPISTLE TO. One of the Epistles of the New Testament and the only letter of Paul written to an individual on a purely private matter that has been preserved. In it Paul appeals to his friend Philemon in behalf of Onesimus, a fugitive slave, who, under the influence of Paul, had become a convert to the Christian faith. This fugitive Paul sends back to his master with a letter praying for the culprit's pardon and even hinting at emancipation. The letter was, almost without doubt, written during Paul's first imprisonment in Rome (c.58-60 A.D.). The special value of the letter consists not only in the light it throws on Paul's attitude towards slavery as it then existed in the Roman Empire, but also in the beautiful exhibition of Christian courtesy and a fine sense of honor on Paul's part, in which respect it is unparalleled among the writings of antiquity. Consult: Ellicott, *Philippians, Colossians, and Philemon* (Andover, 1865); Lightfoot, *Colossians and Philemon* (1876); Von Soden in *Hand-Commentar zum Neuen Testament*, vol. iii (Freiburg, 1893); H. C. G. Moule, *Colossians and Philemon*, in *Cambridge Bible for Schools and Colleges* (Cambridge, 1894); M. R. Vincent, *Philippians and Philemon*, in *International Critical Commentary* (New York, 1897); G. C. Martin, in *New Century Bible* (ib., 1902); Alexander MacLaren, *Colossians and Philemon*, in *Expositor's Bible* (ib.,

1903); James Moffatt, *Introduction to the Literature of the New Testament* (ib., 1911).

PHILEMON AND BAUCIS, βαΐσις. According to a myth related by Ovid in his *Metamorphoses*, viii, 610-715, a pair of poor Phrygian peasants. Jupiter and Mercury, wandering through Phrygia in human form, were hospitably entertained by them, after all the neighborhood had turned the wanderers from their doors. On going away the gods took the pair with them to a neighboring mountain, whence they saw their village covered with a flood, but their own cottage changed into a splendid temple. Jupiter permitted them to make any request they chose, but they only asked to be servants of his temple and to die at the same time. Therefore in their extreme old age the gods transformed Philemon into an oak and Baucis into a linden, which long stood in front of the temple and were honored by the people. The story, which has been much elaborated by Ovid, contains two elements common in popular tales—the rescue from a flood by divine interposition and the reward for hospitality to supernatural visitors in disguise. The vitality of the legend in Phrygia seems emphasized by the experience of Paul and Barnabas at Lystra (Acts xiv).

PHILETAS (Lat., from Gk. Φίλητας), or **PHILITAS**, of Cos. A Greek grammarian and poet who lived about the close of the fourth century B.C., tutor to Ptolemy II Philadelphus of Alexandria. His poems, which were chiefly elegies devoted to the praises of his mistress, Battis, were ranked next to those of Callimachus by the Alexandrian critics, and were imitated by Propertius. He wrote epics also, and notes on Homer, and a vocabulary, called *Ἀρακτα*, in which he explained rare and obscure and dialectal words. The scanty fragments that remain have been published by Bach (1829). Consult Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (5th ed., Munich, 1911).

PHILHARMONIC SOCIETIES (from Gk. φιλεῖν, *philein*, to love + ἁρμονία, *harmonia*, harmony). Organizations formed for the cultivation of orchestral music. The four most important are those of London, New York, Vienna, and Berlin.

London. This is the oldest association of orchestral performers in England. In 1813 a number of music lovers founded the Philharmonic Society and the first concert was given March 8 of that year. According to the constitution only concerted pieces were to be performed; all soli and concertos were excluded. But when a little later some of the members formed quartets the society ceased to perform chamber music at its concerts and restricted itself to instrumental works for orchestra. In 1820 the term "conductor" (q.v.) appears for the first time upon the programmes, and it designated the person at the piano. After 1821 the conductor stood before the orchestra and directed by means of a baton. Since 1869 the organization has published analytical programmes for its concerts, at which the most eminent instrumental and vocal artists of their time have appeared. Up to 1908 the concerts were directed by a regular conductor for the season. Unfortunately the choice usually fell on distinguished composers who had few qualifications of eminent conductors. Under the last regular conductor, Sir F. Cowen (1900-07), the concerts fell off to such an extent that

rumors of a dissolution began to spread. The board of directors then adopted the policy of inviting the most famous European conductors, and this system of guest conductors has been the rule since 1908. In 1913 the society celebrated the centenary of its existence with a series of splendid festival concerts.

New York. The Philharmonic is the oldest permanent orchestral association in New York. It was founded in 1842, the first concert taking place December 7 of that year. From the beginning it consisted of professional musicians only. As an educational factor the Philharmonic Society has been of greater importance in the musical life of America than any other organization, with the possible exception of the Boston Handel and Haydn Society. (See CHORAL SOCIETIES.) Up to 1865 various members of the orchestra acted as conductors. In that year a conductor for the season was chosen, the first being Carl Bergmann, who directed the concerts until 1876. After Dr. Leopold Damrosch (q.v.) had been conductor for one season, Theodore Thomas held the post from 1877 to 1890. He was succeeded by Anton Seidl. From 1898 to 1902 Emil Paur was conductor, and this period was marked by the production of an unusual number of new works, especially of the Neo-German school. In 1902 Walter Damrosch was conductor. For three seasons (1903-06) the policy of having famous guest conductors was followed, without, however, producing the results expected. From 1906 to 1909 Safonov (q.v.) guided the destinies of the society. The society had now reached a critical point of its existence. The steady deterioration in the quality of the performances was not owing to the conductors, but to the large numbers of superannuated players. In 1909 a number of music lovers raised a fund of \$100,000 on condition that the society be entirely reorganized. Gustav Mahler was appointed conductor and was vested with autocratic power. He reduced the orchestra from 125 to 100 efficient players, and rehearsed daily during a season of 23 weeks. The results of this change were noticeable almost at once. When Mahler died, in 1911, he was succeeded by Josef Stransky (q.v.), who realized the dream of his distinguished predecessor, so that the organization is now the equal of the famous Boston Symphony Orchestra. In 1912 Joseph Pulitzer (q.v.) in his will bequeathed the sum of \$1,000,000 to the Philharmonic society, dependent on certain conditions tending towards the highest efficiency in orchestral playing. These conditions were considered fulfilled in 1914, when the full amount was paid to the society.

Vienna. The society known as Philharmonische Gesellschaft was founded in 1842 by Otto Nicolai, at that time conductor at the Imperial Opera. As the Gesellschaft der Musikfreunde (q.v.) was fast degenerating, there was positive need of an organization that would give artistic performances. The first concert of the new society took place Nov. 27, 1842, and the venture immediately met with great favor and pecuniary success. The programmes consisted generally of two symphonies, with smaller works. Instrumental solos, however, were not permitted. When Nicolai accepted an engagement in Berlin, in 1847, the Philharmonische Gesellschaft almost came to an end. In fact, no concerts were given from 1850 to 1854. Then Carl Eckert reorganized the or-

chestra, and in 1860 the energetic Otto Dessoff succeeded in bringing the orchestra to a high degree of perfection. Since then the Philharmonische Concerte have stood invariably for musical progress. The conductor in 1902 was Hans Richter, under whose leadership the society established its reputation as one of the foremost orchestral institutions of the world. From 1903 to 1908 the society adopted the policy of inviting the most famous European conductors as guests. In 1908 Weingartner (q.v.) became regular conductor.

Berlin. The Berlin Philharmonic Society was founded by Edward Rietz (1802-32). This orchestra at first consisted of about 40 instruments, but the number was subsequently increased and the organization now ranks with the best orchestras of Europe. Its concerts are given in the Philharmonic. It was the first regular symphony orchestra that inaugurated a regular series (besides the severe symphony concerts) of concerts of lighter character at popular prices. This policy met with such favor that the members were obliged to remain together the whole summer to give similar concerts. This overwork made itself felt before long in the deterioration of the quality of the regular symphony concerts, and matters came to a crisis when Nikisch appeared as a rival with his famous Elite Concerts. In order to relieve the Philharmonic Society from excessive strain, the city of Berlin, in 1912, granted an annual subvention of 80,000 marks, on condition that the excessive number of summer concerts be reduced.

PHILHELLENES, fil-hè'lénz (from Gk. φιλέλλην, *philellên*, friend of the Greeks, from φιλεῖν, *philein*, to love + Ἕλλην, *Hellên*, Greek). A name given to those who were friendly to the modern Greeks in their struggle for independence. They were constituted into associations for the purpose of receiving and distributing gifts in aid of those engaged in the contest. The members came from all countries, and included such men as Byron, King Louis I of Bavaria, and a body of volunteers who fought for the Greeks under the leadership of General Normann.

PHILIDOR, ANNE DANICAN (1681-1728). A French composer, born in Paris. More important than his compositions are the services he rendered to the cause of public concerts through the establishment of the Concerts Spirituels (q.v.). His works include the operas *L'Amour Vainqueur*, *Diane et Endymion*, *Danaë*. See CONCERT.

PHILIDOR, FRANÇOIS (1726-95). A French composer and chess player, born at Dreux. His real name was François André Danican. Although he received a thorough musical training under Campra, he devoted his energies to chess, at which game he excelled to such an extent that he soon was world-famous. His love for music, however, could not be suppressed, and when two one-act operas, *Blaise le savetier* and *L'Huitre et les plaideurs*, met with more than ordinary success in 1759, he devoted himself entirely to dramatic composition, and for several decades remained the chief representative of French opéra comique. Of his 25 operas the most important are *Le maréchal ferrant* (1761), *Le sorcier* (1764), *Ernêlinde* (1767), *Les femmes vengées* (1775), *Verée* (1780), *La belle esclave* (1787). He wrote also a requiem in memory of Rameau.

PHILIP (Gk. Φίλιππος, *Philippos*, lover of

horses, from *philein*, *philein*, to love + *ἵππος*, *hippos*, horse), THE APOSTLE. One of the 12 disciples of Jesus. He was of Bethsaida (q.v.) and thus a fellow townsman of Andrew and Peter, and is quite likely to have been with them a follower of John the Baptist before he was called directly to become a disciple of Christ. (John i. 43, 44.) He and Andrew alone among the Apostles had Greek names, which may indicate that they were of Greek descent (cf. John xii. 20-22), a fact not impossible even in the population of the Jewish Bethsaida, as distinguished from the Greek Bethsaida Julias near by. He does not figure extensively in the records of the ministry of Jesus. The only notices which we have of him, apart from the Apostle lists in the Synoptic Gospels and the Book of Acts, are given us in the Fourth Gospel (i. 43-48; vi. 5, 7; xii. 21, 22; xiv. 8, 9), and these show him to be a man of quick appreciation of the religious element in Jesus' mission (John i. 43, 45 f.), but of not much confidence in its application to the problems with which he was confronted. (John vi. 5 f.; xii. 20-22; xiv. 7-11.) His work after the death of Christ is involved in traditions which at times confuse him with Philip the Evangelist. (Cf. Eusebius, *Hist. Eccles.*, iii, 31.) There are two apocryphal works bearing his name, the *Journeyings of Philip the Apostle* and the *Acts of Philip*. They are of slight historical value. Tradition of the safer sort assigns his labors to the region of Hierapolis in Asia Minor. The manner of his death and its date are both unknown.

PHILIP, THE EVANGELIST. One of the seven chosen by the first Christian church in Jerusalem to be the stewards of its charity to the widows and poor. (Acts vi. 5.) It is likely that he was a Hellenist, as were others of the group. Later he engaged in missionary activity, his initial work being among the Samaritans. (Acts viii. 4-5.) This was the first step outward from the limits of a Jewish cult for the new Christian faith. A second step was taken when Philip gave baptism to an Ethiopian eunuch. (Acts viii. 26-40.) He finally settled in the region of Cæsarea, on the coast, where Paul was entertained at his house. (Acts xxi. 8.) His four virgin daughters were reputed to have the gift of prophecy. (Acts xxi. 9.) Tradition is not clear concerning his life after this, confusing him with the Apostle Philip. He appears to have removed finally to Asia Minor, living possibly at Hierapolis and also at Tralles. Consult H. Cowan, in *Hastings, Dictionary of the Bible*, s. v.

PHILIP, THE TETRARCH. See HEROD.

PHILIP II (382-336 B.C.). King of Macedonia and father of Alexander the Great. He was born at Pella and was the youngest son of Amyntas II and Eurydice. When a youth he was taken by Pelopidas as a hostage to Thebes, where he lived several years. After the murder of his eldest brother, Alexander, by Ptolemy Alorites, he was appointed by his brother Perdiccas, when the latter, having slain Ptolemy, came to the throne, to the governorship of a separate district of the country. About 359 B.C. Perdiccas was slain in battle while fighting with the Illyrians, and Philip assumed the government as guardian of his young nephew, Amyntas, the son of Perdiccas; but he soon set aside Amyntas and took the crown himself. At this time Macedonia was attacked on one side by the Illyrians, Pannonians, and other tribes, and on

the other by the Athenians, while within she was torn by the dissensions of several pretenders to the throne; but, buying off the Thracians, who were supporting the pretender Pausanias, conciliating the Athenians, who had taken up the cause of another pretender, Argæus, killing or otherwise disposing of the remaining pretenders, and defeating in battle the threatening tribes, Philip firmly established himself on his throne in less than two years. Henceforth his policy was one of aggression, and the Greek towns on the coast of Macedonia were the first objects of attack. Amphipolis, Pydna, and Potidæa, Athenian possessions or allies on the coast of Macedonia, were the first places to fall into his hands. He then secured possession of the rich and valuable gold mines of Thrace, together with the town of Grenides, which he enlarged and called by the name of Philippi. These victories had all been obtained before 355; in 354 he took Methone, on the Thermaic Gulf, after a long siege, in the course of which he lost an eye, and then advanced into Thessaly, to aid the Aleuadæ against Lycophron, the tyrant of Phæræ. Defeating the force that was sent to oppose him, he established his supremacy throughout Thessaly and advanced as far south as the pass of Thermopylæ. The pass being guarded by a strong force of Athenians, who had been aroused by the eloquent warnings of Demosthenes, he returned and directed his arms against Thrace, where he succeeded in establishing his ascendancy. In 349 he began his attacks on the Chalcidian cities, and in 347 completed the conquest of the Chalcidic peninsula by taking the city of Olynthus. In 346 he succeeded in gaining a further foothold in Greece, being called in by the Thebans to assist in the Sacred War against the Phocians. All the towns of Phocis, numbering 22, together with the pass of Thermopylæ, surrendered to Philip without resistance. The place which the Phocians had occupied in the Amphictyonic Council was transferred to him, and he was appointed, jointly with the Thebans and the Thessalians, president of the Pythian games. In the following years he was again in Thrace, endeavoring to bring the cities in that country under his rule. He was unsuccessful in his attempt on Perinthus and Byzantium, and turned his attention once more to the northern tribes. In 339 B.C. he was again invited into Greece, this time by the Amphictyonic Council, to take charge of the army that was to oppose the Locrians. Alarmed at Philip's continued successes and by his entrance into Greece, the Athenians formed a coalition with Thebes and other Greek States to oppose his advance, but the united army was utterly defeated at the battle of Chæronea in 338. This battle marks the end of Greek independence; Philip was now master of Greece. He at once began preparations for the invasion of Persia on a grand scale. In 337, when deputies from all the different states of Greece except Sparta assembled at Corinth, he was chosen commander in chief of the Greek forces. In the midst of his preparations, however, he was assassinated at *Ægæ* by a youth of noble blood named Pausanias, while attending a celebration in honor of the marriage of his daughter with Alexander of Epirus (336 B.C.). The motive for the deed, as stated by Aristotle, was private resentment for neglect on Philip's part to punish Attalus for a gross insult offered to

Pausanias. Consult the histories of Greece by Abbott, Holm, Busolt, etc.; D. G. Hogarth, *Philip and Alexander of Macedon* (1897); A. W. Pickard-Cambridge, *Demosthenes and the Last Days of Greek Freedom* (New York, 1914). See GREECE, *History, Ancient History*.

PHILIP III. A king of Macedonia. See ARRHIÆUS.

PHILIP V (237-179 B.C.). King of Macedonia, son of Demetrius II and grandson of Antigonus Gonatas. He succeeded his uncle Antigonus Doson in 220. The first part of his reign was disturbed by the contentions of the Ætolian and Achaean leagues; taking part with the latter, he conducted the war for several campaigns with ability and success. (See ACHÆA; ÆTOLIA.) This war was called the Social War and was concluded in 217 by the Peace of Naupactus. In 216-215 Philip was induced by the successes of Hannibal in Italy to conclude an offensive and defensive alliance with Carthage, the price of which was to be the Roman possessions in Illyria and the help of Carthage in his Grecian wars. The war which followed (214-205) is known as the First Macedonian War; at no time in the course of it did Philip render Hannibal any effective aid, and for the first three years the war was conducted on both sides with lack of energy. In 214 the Roman general, M. Valerius Levinus, compelled Philip to raise the siege of Apollonia, and in 211 Rome organized against Macedon a coalition of Greek states with the Ætolian League at the head. Peace was concluded in 205 without material gain on either side. In 204 Philip made a bargain with Antiochus III to divide between them certain of the dominions of the youthful King of Egypt, Ptolemy Epiphanes. This interference of Philip in the East precipitated the Second Macedonian War with Rome, which began in 200 and was brought to a close by the battle of Cynoscephalæ in 197. In this battle the Macedonian army was utterly defeated by Titus Quintius Flamininus; Philip was compelled to relinquish his conquests in Europe and Asia, to surrender his fleet, and to pay an indemnity of 1000 talents; Macedonia became an ally, subject to the control of Rome. Philip died in 179 and was succeeded by his son Perseus. Consult: Johannes Droysen, *Geschichte des Hellenismus* (2d ed., Gotha, 1877-78); J. P. Mahaffy, *Alexander's Empire* (New York, 1888); E. A. Freeman, *History of Federal Government* (2d ed., ib., 1893); "Philippos, 4" in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914).

PHILIP I (1052-1108). King of France from 1060 to 1108. He was the eldest son of King Henry I and Anne of Russia. Until 1066, when Philip came of age, his mother and his uncle, Baldwin V of Flanders, were regents. In the various contests of his great feudatories, to whom belonged William I of England as Duke of Normandy, Philip often intervened successfully, so that the royal domain was increased until it extended from the valley of the Seine to the valley of the Loire and also included Bourges. About 1071 Philip married Bertha, stepdaughter of Count Robert of Holland. Though a son was born to them in 1081 (later Louis VI), and afterward a daughter, Philip repudiated his wife in 1092 and began to live with Bertrada, the wife of Count Fulk of Anjou. The result was a continuous strife between the

papacy and the King. In 1095, at the Council of Clermont, Urban II excommunicated Philip, though Bertha had died in 1094. This excommunication was raised, in 1104, after Philip had promised to put Bertrada away. Consult: E. A. Freeman, *Norman Conquest*, vol. iv (New York, 1873); id., *William Rufus*, vol. ii (Oxford, 1882); Bernard Monod, *Essai sur les rapports de Pascal II, avec Philippe I* (Paris, 1907).

PHILIP II, or PHILIP AUGUSTUS (1165-1223). King of France from 1180 to 1223. He was the son of Louis VII and Adèle of Champagne and was born Aug. 21, 1165. He was crowned Nov. 1, 1179, in the lifetime of his father, succeeded him in 1180, and proved one of the greatest monarchs of the Capetian dynasty. In 1181 he made war upon the Count of Flanders and in 1185 forced him to surrender the districts of Vermandois and Amiénois. In 1182 he drove the Jews out of his territories and confiscated all their wealth. In 1187 the English attempt to conquer Languedoc caused a war, in which Philip was aided by the sons of Henry II (q.v.). After the accession (1189) of Richard to the English throne, Philip and he set out together on the Third Crusade (1190), but quarreled while wintering in Sicily, and, their dissensions continuing, Philip, after a sojourn of three and a half months in Syria, set out on his return to France, after taking a solemn oath to respect the integrity of Richard's dominions. No sooner, however, had he returned than he entered into an arrangement for the partition of Richard's territories in France with his unworthy brother, John. Some acquisitions were made, but Richard's return thwarted the calculations of the conspirators, and a war immediately began between the two monarchs, in which Philip had at one and the same time to defend his territories against the English and the counts of Blois, Boulogne, Flanders, and Toulouse, who attacked them on all sides. Richard died in 1199; but on the appeal of the barons of Poitou to Philip, as John's overlord, the war was soon resumed against John (q.v.). The English provinces in France were attacked by the combined French and Bretons, and Normandy, Poitou, Maine, Anjou, and Touraine were annexed to France. In the years 1213 and 1214 Philip waged war against Flanders and thus caused a coalition to be formed by Otho IV (q.v.) of Germany, John of England, and the Count of Flanders. Philip defeated the allies in 1214 at Bouvines (q.v.). During the rest of his reign Philip was occupied in consolidating his new possessions, and took no part in the war against the Albigenes. In general, Philip was in alliance with the Church and the great cities. His first wife was Isabella of Hainault, the mother of Louis VIII; he next married Ingeborg of Denmark, but repudiated her to marry Agnes of Meran. For this he was excommunicated and France was placed under an interdict. Philip yielded in 1200 and took back Ingeborg, but she was not recognized as Queen till 1213. He improved and embellished Paris, built many churches and other institutions, encouraged commercial associations, and gave the first charter to the University of Paris. He fortified many of the chief towns, including the capital. He died at Mantes, July 14, 1223. Philip was the first monarch under whom France attained a commanding position in Eu-

rope. Consult: Achille Luchaire, *Philippe Auguste* (Paris, 1881); W. H. Hutton, *Philip Augustus* (London, 1896); Alexander Castelletti, *Philipp II August* (3 vols., Leipzig, 1899-1910); Ernest Lavisse, *Histoire de France*, vol. iii, part i (Paris, 1901); Edouard Audouin, *Essai sur l'armée royale au temps de Philippe Auguste* (ib., 1913).

PHILIP III, LE HARDI, i.e., the Bold (1245-85). King of France from 1270 to 1285. He was the son of Louis IX, and had his father's piety, but not his ability. He was an unimportant man personally, led by his favorites, who were of low birth, or by his wife and his mother, who antagonized each other, or by his uncle Charles of Anjou. Consult C. V. Langlois, *Le règne de Philippe III le Hardi* (Paris, 1887), and Ernest Lavisse, *Histoire de France*, vol. iii, part ii (ib., 1901).

PHILIP IV, THE FAIR (1268-1314). King of France from 1285 to 1314. He succeeded his father, Philip III. During his reign, which was of exceeding importance for the development of the French monarchy, he had three prominent advisers, Pierre Flotte, William of Nogaret, and Enguerrand of Marigny, who, being all taken from the rising legal class, were known as *légistes*. The event that stands out most prominently in this reign was the conflict with the papacy under Boniface VIII (q.v.). The French government sought to tax the clergy, whereupon Boniface interfered and issued the bull *Clericis laicos* in 1296, forbidding the clergy to pay taxes to the King. Boniface, it is true, gave way at once when a decree was issued forbidding the exportation of metals from France, the effect of which would have been to cut off a large portion of the papal revenue, but the success of the Jubilee at Rome in 1300 induced Boniface to believe that he would find sufficient support in a struggle with Philip IV, and hence when in 1301 Bernard Saisset, Bishop of Pamiers, a papal representative in France, was arrested there, Boniface issued his famous bull *Unam sanctam*. This set forth the highest papal pretensions and was a challenge to all monarchs of Europe. Philip, in order to be certain of support, summoned the States-General for the first time in the history of France. In 1303 while Boniface was at Anagni he was suddenly captured by William of Nogaret, and, though released the following day, he died soon after that as a result of the shock. After the short rule of Benedict XI Philip obtained in 1305 the election of his adherent, the Archbishop of Bordeaux, to the papal chair, as Clement V. In 1309 the Pope took up his residence at Avignon, and until 1378 the papacy was entirely under French influence, this being the period of the so-called Babylonish Captivity. See PAPACY.

On account of the increased expenditures of the monarchy because of its greater extension and enlarged duties, it was found more and more difficult to carry on the government with the old revenues alone. A temporary expedient was found by compelling Clement V to condemn the wealthy Templars and deliver their property over to the French King. Early in his reign Philip had difficulties with Edward I of England. In 1294 he took possession of Guienne, Edward's territory, and in 1297 attacked Guy, Count of Flanders, who had supported the English monarch. Boniface VIII brought about a truce in 1298, between France

and England, and Guienne was restored to Edward; but Guy of Flanders was not included and Philip occupied Flanders in 1300-1301. His officials treated the wealthy Flemish cities so harshly that they revolted under Peter of Koninck. Philip's army was decisively defeated at Courtrai (q.v.) in 1302, and in 1305 he made peace, restoring Flanders to the son of Count Guy.

Scholars have long disputed concerning the true character of Philip. On the one hand he has been represented as an avaricious, scheming monarch; on the other as a mild man, who was completely in the hands of bold councilors. But concerning the results of his reign there is no question. Feudal usages were restricted, and the power of the crown was vastly extended. In order to meet the financial needs of the state, the taxes were increased, the Jews persecuted and their property confiscated; and when these means were insufficient the coinage was debased. Philip's wife was Jeanne, Queen of Navarre, through whom the latter country was annexed to France. Philip and Jeanne's three sons, Louis X, Philip V, and Charles IV, were in succession Kings of France and Navarre.

Bibliography. Edgard Boutaric, *La France sous Philippe le Bel* (Paris, 1861); Frantz Funck-Brentano, *Les origines de la Guerre de Cent Ans: Philippe le Bel en Flandre* (ib., 1897); Ernest Lavisse, *Histoire de France*, vol. iii, part ii (Paris, 1901); Richard Scholz, *Die Publizistik zur Zeit Philipps des Schönen und Bonifaz VIII* (Stuttgart, 1903); Karl Wenck, *Philipp der Schöne von Frankreich* (Marburg, 1905); Heinrich Finke, *Papsttum und Untergang des Templerordens* (2 vols., Münster, 1907); also *Cambridge Modern History*, vol. i (New York, 1902).

PHILIP V, LE LONG, i.e., the Tall (1293-1322). King of France from 1316 to 1322. He was the second son of Philip IV, and on the death of his brother, Louis X, was made Regent, as the Queen was with child. Her son died four days after birth and Philip proclaimed himself King. Many opposed him, supporting the claims of his niece, the daughter of Louis X. An assembly of nobles, prelates, and citizens, summoned by Philip in 1317, declared that women could not succeed to the throne. (See SALIC LAW.) In 1320 a large number of peasants, known as Pastoureaux, led by some renegade clerks, demanded to be taken on a crusade. They committed horrible outrages, especially the massacre of Jews, but were finally suppressed. Philip's reign is noteworthy for its many administrative reforms. He centralized the treasury receipts at Paris, suppressed the garrisons in castles not on the frontiers, confiscated for the crown many feudal rights of taxation enjoyed by the nobles, and organized the army more efficiently. In other attempted reforms he was thwarted by opposition from the States-General. Consult Paul Lehugeur, *Histoire de Philippe le Long* (Paris, 1897), and Ernest Lavisse, *Histoire de France*, vol. iii, part ii (ib., 1901).

PHILIP VI (1293-1350). King of France from 1328 to 1350, the first King of the house of Valois. He was the son of Charles of Valois, younger brother of Philip IV. At first Regent of France on the death of Charles IV, the proclamation of a king being deferred on account of the pregnancy of Charles IV's widow, he was crowned at Rheims on May 29, 1328, after

the Queen had given birth to a girl. His right to the throne was denied by Edward III of England, the grandson of Philip IV, who declared that females, though excluded from the throne by custom (see *SALIC LAW*), could transmit their rights to their children, and therefore insisted upon the superiority of his own claims. Philip's reign began gloriously, for, marching into Flanders to support the Count against his rebellious subjects, he wiped out the disgrace of Courtrai by vanquishing the Flemings at Cassel, Aug. 23, 1328. His next great project was a crusade, for which he took the cross in 1332. At the beginning of 1336 the crusade seemed certain, but the relations with England were very strained, and in 1337 the Hundred Years' War (q.v.) began. It was carried on languidly for several years, the only prominent incident being the destruction of the French fleet off Sluys, June 24, 1340. Philip was very extravagant and delighted in maintaining a brilliant court. The round of fêtes and tournaments never was interrupted, even when the war had well-nigh exhausted the wealth of the country, for the money to carry them on was provided by some new tax, by an arbitrary change in the coinage, or by some fresh confiscation. In 1346 Edward III landed in Normandy, ravaged the country to the environs of Paris, and defeated Philip at Crécy (q.v.). The following year Edward captured Calais. A truce was concluded by papal mediation, in 1347, but the Kingdom had no sooner been released from war than destruction in another and more terrible form, that of the black death (q.v.), appeared. Nevertheless the extravagance at the court was as great as ever. At Philip's accession the royal domain was increased by the possessions of Valois, Chartres, Anjou, and Maine; later MontPELLIER and Dauphiné were added. But Philip gave Navarre to Jeanne, daughter of Louis X, and also Angoulême and Mortain, thus diminishing the crownlands to this extent. Consult Ernest Lavisse, *Histoire de France*, vol. iv, part i (Paris, 1902), and Auguste Molinier, *Les sources de l'histoire de France*, vol. iv (ib., 1904). These works contain extensive bibliographical references for the many subjects involved. See *FRANCE, History*.

PHILIP II (1527-98). King of Spain from 1556 to 1598. He was born at Valladolid on May 21, 1527, the only son of the Emperor Charles V (q.v.). His education was chiefly in the hands of the clergy and he grew up a cold and bigoted man. In 1543 he was married to Maria of Portugal, and upon her death he espoused in 1554 Mary I of England (q.v.). In 1555 Charles V surrendered the government of the Netherlands to Philip, and in the following year resigned also the crown of Spain to his son, who had been previously invested with the sovereignty of Naples, Sicily, and Milan. The possessions of Spain in the New World included the West Indies, Mexico, and a great part of South America. The early part of the reign of Philip proved very successful. He defeated a coalition formed against him by the Pope and France, his armies winning several battles, notably that of Saint-Quentin (1557), and France was compelled to sign on April 2-3, 1559, the Treaty of Cateau-Cambrésis (q.v.), which marked the abandonment of her rôle as an aggressive power on the side of Italy. Philip determined to stamp out opposition to

Roman Catholicism in all his dominions, and this caused the revolt of the Netherlands (q.v.). This successful rebellion and the enormous expenses it entailed upon Spain ruined the prosperity of Philip's dominions. The naval supremacy of Spain, moreover, was shattered by the defeat of the Armada (q.v.), which Philip had sent against England in 1588. Besides the war against England Philip was led by the affairs in the Netherlands to interfere also in the concerns of France. He has been sometimes accused of having instigated the Massacre of St. Bartholomew, and he supported the Guises against Henry of Navarre (later Henry IV), but all in vain. On May 2, 1598, the Treaty of Vervins (q.v.) was concluded with France. Against the Turks Philip was more successful. They were decisively defeated in 1571 by his half brother, John of Austria, commanding the fleet of the Holy League (Spain, Venice, the Papal States), at Lepanto (q.v.). Portugal was conquered by Philip's general, the Duke of Alva (q.v.), after the direct male line of that country had become extinct in 1580. But these successes were unable to outweigh the ruin of Spanish commerce and industry. Philip died after a lingering illness on Sept. 13, 1598. After the death of Mary of England in 1558, Philip married in 1559 Elizabeth, the daughter of Henry II of France, and when she died in 1568 he married Anna, a daughter of the Emperor Maximilian II. By his first wife Philip had a son, the celebrated Don Carlos (q.v.), and by his fourth wife, his successor, Philip III (q.v.). Philip II's character has been the subject of considerable historical controversy. There can be little doubt that he was bigoted and morose, but, on the other hand, the popular view, which represents him as a cruel monster, is a false one. He seems to have been an idealist and a visionary, who believed firmly that he was benefiting humanity by his drastic measures. He was often open to appeals for mercy and leniency, but the Inquisition was not only permitted a free sway in Spain, but was carefully developed by Philip as a powerful means of support in his various quarrels with the Church, and all liberty was crushed.

Bibliography. L. P. Gachard, *Correspondance de Philippe II sur les affaires des Pays-Bas* (5 vols., Brussels, 1848-79); id., *Lettres de Philippe II à ses filles les Infantes Isabelle et Catherine* (Paris, 1884); id., *Correspondencia de Felipe II con sus embajadores en la corte de Inglaterra, 1558-84* (4 vols., Madrid, 1888); F. A. M. Mignet, *Antonio Perez et Philippe II* (Paris, 1874); Henri Fournier, *Histoire de Philippe II* (ib., 1880-82); Martin Philippson, *Westeuropa im Zeitalter von Philipp II, Elisabeth und Heinrich IV* (Berlin, 1882); M. A. S. Hume, *Philip II* (London, 1897); W. H. Prescott, *History of the Reign of Philip II* (new ed., 3 vols., Philadelphia, 1902); M. A. S. Hume, *Spain: Its Greatness and Decay, 1479-1788* (New York, 1905); id., *Two English Queens and Philip* (ib., 1908). See *SPAIN*.

PHILIP III (1578-1621). King of Spain from 1598 to 1621. He was the son of Philip II, and is to be remembered chiefly for accelerating the ruin of Spain, which had begun under his father, by turning the entire government over to his favorites, the Duke of Lerma and the son of the latter, the Duke of Uceda, and by driving out in 1609 and 1610 the Moriscos (q.v.), the most industrious and thrifty inhab-

itants of Spain. Consult H. C. Lea, *The Moriscos of Spain* (Philadelphia, 1901), and M. A. S. Hume, *Spain: Its Greatness and Decay, 1478-1788* (New York, 1905).

PHILIP IV (1605-65). King of Spain from 1621 to 1665. He took little part in the affairs of government, which from 1623 to 1643 were in the hands of his favorite Olivares (q.v.). In spite of the latter's efforts for the encouragement of trade and industry, the decline of Spain was hastened by exhausting wars in Germany and with France. In 1640 Portugal conquered its independence, and by the Treaty of Westphalia Spain acknowledged the independence of the Netherlands. The Peace of the Pyrenees in 1659 was highly favorable to France. Philip's reign was disturbed also by insurrections in Catalonia and Andalusia. Philip IV was a generous patron of art and letters, as witness his relations with Velazquez, Lope de Vega, and Calderón. There is credible evidence that he was not without literary talent himself. Consult Francisco Silvela's introduction to his edition of the *Cartas de Sra. María de Agreda y del rey Felipe IV* (Madrid, 1885-86), and Antonio Cánovas del Castillo, *Estudios del reinado de Felipe IV* (ib., 1889).

PHILIP V (1683-1746). King of Spain from 1700 to 1746, first of the Spanish Bourbon dynasty. He was directly descended on both sides from Philip II, and was born at Versailles, Dec. 19, 1683, the son of the Dauphin Louis and Maria Anna of Bavaria, and grandson of Louis XIV and Maria Theresa, eldest sister of Charles II of Spain. The Archduke Charles of Austria, second son of the Emperor Leopold I, stood equally near the Spanish succession; but Charles II, dying without issue, left the Kingdom by his last will to Philip, then Duke of Anjou (1700). Philip was at once proclaimed at Fontainebleau and at Madrid as Philip V. To defend this succession, which threatened to disturb the religious political balance in Europe, France and Spain became involved in war with the Grand Alliance, formed by England, Holland, and Austria, and joined by Prussia, Denmark, Hanover, Portugal, and finally Savoy. (See SUCCESSION WARS.) The Peace of Utrecht (April 11, 1713) secured the throne of Spain to Philip, but shorn of the Italian possessions and the Netherlands. Philip V was distinguished "for few faults and few virtues," was weak-minded, and became almost imbecile before his death. His first wife, Marie Louise of Savoy, died in 1714, and with her death ended the influence the Countess Orsini had acquired over him, for Philip married Elizabeth Farnese of Parma, an energetic and ambitious woman. Her schemes for advancing the interests of her sons kept Spain embroiled throughout the reign. The minister Cardinal Alberoni (q.v.) directed his policy towards regaining the lost Spanish possessions in Italy, and had to be removed because of the hostility aroused among the Powers. In 1724 Philip abdicated in favor of his eldest son, Louis, but upon the death of the latter in the same year he resumed the crown, notwithstanding his increasing incapacity. In 1734-35 Don Carlos, son of Philip, wrested the Two Sicilies from Austria. In 1741 Spain entered into an alliance with France against Maria Theresa in the War of the Austrian Succession. (See SUCCESSION WARS.) Philip died at Madrid on July 9, 1746. He was succeeded by his second son, Ferdinand VI (q.v.). Consult:

William Coxe, *Memoirs of the Kings of Spain of the House of Bourbon from the Accession of Philip V to the Death of Charles III* (5 vols., London, 1815); a work that is still of value, although new sources have come to light since it was written; A. Baudrillart, *Philippe V et la cour de France, 1700-15* (2 vols., Paris, 1890); Alfred Morel-Fatio, *Recueil des instructions données aux ambassadeurs de France (Espagne)*, vols. i-iii (ib., 1894-99). See SPAIN.

PHILIP, GOSPEL OF. See APOCYPHA, *New Testament*.

PHILIP, JOHN WOODWARD (1840-1900). An American naval officer, born in New York City. He was appointed to the United States Naval Academy at the age of 16, became midshipman in 1861, and during the Civil War served in the Gulf blockading squadron, the James River fleet, and the South Atlantic blockading squadron, acting as executive of the *Chippewa*, *Pawnee*, and *Montauk* at the siege of Charleston. In July, 1862, he was promoted to be lieutenant and in July, 1866, to be lieutenant commander. After the war he was executive successively of the *Hartford* and the *Richmond*, was placed in command of the *Monocacy* in June, 1873, and in December, 1874, was commissioned commander. From 1874 to 1876, on leave of absence, he commanded one of the steamers of the Pacific Mail Steamship Company, running between San Francisco and Hongkong, and in 1877, again on a leave of absence, he commanded the Woodruff scientific expedition around the world. He was promoted to be captain in 1889, commanded the Boston Navy Yard from 1894 to 1897, and in the latter year was placed in command of the battleship *Texas*, which, still under his command, took a prominent part in the naval battle of Santiago during the Spanish-American War. In August, 1898, he was promoted to be commodore, was placed in command of the second squadron of the North Atlantic fleet, and in 1899 was made rear admiral. Consult Macley and Philip, *Life and Adventures of Jack Philip, Rear-Admiral U. S. N.* (New York, 1904).

PHILIP, KING (c.1630-76). A famous Indian chief, son of Massasoit; called King Philip by the English, though his Indian name was Metacombt. He became sachem of the Wampanoags, who were settled in the Rhode Island country in 1662, and in the same year went to Plymouth, promising to maintain friendly relations with the English colonists and not to cede any territory without their knowledge. About 1670 his attitude towards the English began to be suspected on account of frequent meetings of the tribes and many murders of white settlers; one of his own Indians, too, had accused him in 1667 of attempting to betray the English to the Dutch or the French. In view of these suspicions Philip and the principal tribesmen were summoned to meet the whites and explain their movements. This they did, and also agreed to surrender their arms; but it was only a truce, and preparations for war were still secretly carried on by the Indians. An Indian convert named Sausamon revealed to the colonists the preparations made by Philip, and he was murdered by the Indians. In revenge for the execution of his murderers by the whites, the Indians killed eight or nine colonists, and open hostilities were begun in June, 1675. The Indians did not venture to meet the colonists in battle, but burned or attacked a number of their

settlements, including Swansea, Brookfield, Deerfield, and Hadley, and laid ambushes for the settlers. In December, 1675, Gov. Josiah Winslow led a force of 1000 men against the Narragansets, with whom Philip had formed an alliance, took by storm a fort said to have contained 4000 Indians, near the present location of Kingston, R. I., destroyed their village of 500 wigwams, and put to death 500 of their warriors and twice as many Indian women and children. The war went on for the first six months of 1676, and was marked by burnings and massacres at Weymouth, Groton, Medfield, and Lancaster, Mass., and at Warwick and Providence, R. I. But the increased efforts of the colonists soon struck demoralization into the ranks of the Indians. A substantial reward was offered by the government for every Indian killed in battle, and many Indian women and children were captured and sold into slavery. A force under the command of the great Indian fighter Capt. Benjamin Church (q.v.) hunted Philip from place to place, at last finding him through the aid of a friendly Indian in a swamp near Mount Hope, where he was killed by another Indian while trying to escape. His body was quartered, on a Thanksgiving Day especially appointed, and his head was sent to Plymouth, where it was long kept on a gibbet. During this war about 600 colonists were killed, 600 buildings burned, and 13 towns destroyed, but of the two once powerful Indian tribes it is said that fewer than 200 individuals were left. Consult: John Fiske, *The Beginnings of New England* (Boston, 1889, new ed., 1900); G. M. Bodge, *Soldiers in King Philip's War* (2d ed., ib., 1906); Ellis and Morris, *King Philip's War* (New York, 1906); K. D. Sweetser, *Book of Indian Braves* (ib., 1913); *Narratives of Indian Wars*, edited by C. H. Lincoln (ib., 1913).

PHILIP, THE ADVENTURES OF. A novel by Thackeray (1862). This sequel to *The Shabby Genteel Story* appeared in the *Cornhill Magazine* (1861-62).

PHILIP NERI, SAINT (1515-95). The founder of the Congregation of the Oratory (q.v.). He was born at Florence of a distinguished family, July 21, 1515. On the loss of his father's property he was sent to a wealthy uncle, who was ready to make him his heir, and with whom he lived for a time at San Germano, near Monte Cassino; but he relinquished these prospects to devote himself to the service of God, and on the advice of the Benedictine monks of Monte Cassino went to Rome to pursue his theological and philosophical studies (1533-37). He devoted himself to works of mercy, once sold his books to feed the poor, and in 1548, in conjunction with his confessor, Persiano Rosa, founded the Confraternity of the Holy Trinity to care for the needs of the vast numbers of pilgrims who visited Rome. This brotherhood is said to have provided hospitality for no fewer than 600,000 pilgrims in the jubilee year of 1625 and for a quarter of a million in 1825. Having long declined holy orders from motives of humility, he finally received them in 1551 and began as a priest a still more remarkable career of devotion and influence. Inspired by the tidings of the heroic labors and death of St. Francis Xavier, he determined to go to the Indies and assembled 20 companions; but he was finally convinced that Rome was meant to be the field of his work. The objects of the informal association out of which

the Congregation of the Oratory later developed were the instruction and training of the young and uneducated. As a means of withdrawing them from dangerous amusements, sacred musical entertainments were held in the oratory (hence called by the name of oratorio), at first consisting merely of hymns set to popular tunes, but afterward partaking more of the nature of sacred dramas. The music was composed by the first musicians of Rome. Palestrina was a spiritual child of Philip's, and died in his arms. It was in the lectures originally prepared for use in the oratory that, at St. Philip's instance, the gigantic Church history of Baronius had its beginning. The personal character of Philip, the unselfish devotion of his life, his unaffected piety, genuine love of the poor, kindly and cheerful disposition, and perhaps as much as anything else a certain quaint humor which pervaded many of his sayings and doings, contributed to popularize his work. The development of the Oratory was almost unconscious. In 1564 Philip was requested by his fellow countrymen the Florentines in Rome to take charge of their church of San Giovanni near the Ponte Sant' Angelo; he declined, until Pope Pius IV gave him permission to hold it while still retaining his residence in his humble cell at San Girolamo. In 1574 the Florentines erected a new oratory near the church, and the exercises were held there for a time; the following year he saw himself compelled to provide for the permanence of his work on a larger scale, and, taking the small church of Santa Maria in Vallicella, he pulled it down and built a large new one. Here he was authorized by Gregory XIII to found a definitely organized congregation in the same year. He still remained at San Girolamo and refused to appear as the head and founder of the new society, until in 1583 he was expressly commanded by the Pope to take up his residence in the new house. Then his associates elected him superior for life, despite all his protests. Ten years later, however, he prevailed upon them to let him lay the burden aside, and Baronius was chosen in his stead. He died May 26, 1595. Paul V beatified him in 1615 and Gregory XV canonized him in 1622. Called the Apostle of Rome, he remains to this day emphatically the popular saint of the Roman people, who observe his feast day with great devotion. From 1726 until the Italian occupation the popes were accustomed to go in solemn state on this day to visit his tomb and to say mass there.

Bibliography. The contemporary lives are by A. Gallonio, G. Barnabei, and P. G. Bacci, the first two contained in the *Acta Sanctorum*; English translation of the last by F. W. Faber (London, 1847; also a new rev. ed. by F. I. Antrobus, 2 vols., St. Louis, 1903); a modern biography by Cardinal Capececiatro (Naples, 1879; Eng. trans., 2d ed., London, 1894); also a *Life* by Mrs. Hope (ib., 1859); by Comtesse D'Estienne d'Orves (Paris, 1900); by A. von Pechmann (Freiburg, 1900); F. W. Faber, *Spirit and Genius of St. Philip Neri* (London, 1850); Cardinal Wiseman, *Panegyric of St. Philip Neri* (ib., 1856); *Maxims and Counsels of St. Philip Neri* (Dublin, 1890).

PHILIP OF SWABIA (c.1177-1208). An emperor of the Holy Roman Empire. He was the youngest son of Frederick Barbarossa and Beatrice of Burgundy. He was educated for the Church and in 1191 became Bishop of Würz-

burg. In 1192 he resigned his see. His brother, the Emperor Henry VI, gave him Tuscany in 1195 and in 1196 he succeeded to the Duchy of Swabia. In 1197 he married the Byzantine Princess Irene. On the death of Henry VI, in 1197, Philip endeavored to secure the Imperial crown for his brother's infant son, Frederick (II), but the German princes were unwilling to place the child on the throne, and Philip himself was chosen Emperor in 1198. But the Guelphs, under the leadership of Adolf, Archbishop of Cologne, put forward as a candidate Otho of Brunswick, who was crowned two months before Philip (1198) and in 1201 gained the support of Pope Innocent III. Philip fought bravely against great odds, and by bribes won over the Archbishop of Cologne and Hermann of Thuringia, with other powerful princes. In 1205 he was again crowned by the Archbishop of Cologne in Aix-la-Chapelle and later captured Cologne, but let his rival slip through his fingers. He finally made terms with Otho and with Innocent III. The former broke his promises, and Philip, making ready to attack him, was assassinated by Otho of Wittelsbach. Consult: E. A. Winkelmann, *Philipp von Schwaben und Otto IV. von Braunschweig* (2 vols., Leipzig, 1873-78); Wilhelm von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol. v (ib., 1888); Achille Luchaire, *Innocent III: la papauté et l'empire* (Paris, 1906).

PHILIPP, ISIDOR (1863-). A French pianist of Austrian birth. He was born at Pest, but early removed to France. In 1879 he entered the Conservatory as a pupil of Mathias and later studied under other famous teachers of that institution. He was intimately connected with the musical life of Paris and did much to spread a love for classical chamber music. Together with Loeb and Berthelier, he organized a series of concerts largely devoted to the presentation of new French compositions. He was also cofounder and subsequent president of the Société d'Art. In 1903 he received the appointment of professor of piano at the Conservatory. His studies for piano are of permanent value.

PHILIPPA OF HAINAULT, fi-lip'pà ov A'nò' (c.1314-69). An English queen, wife of Edward III and daughter of William the Good, of Holland and Hainault. She was married in 1328 to her cousin, Edward of England, by papal dispensation and brought him valuable continental allies during the war with France. It is said that she summoned the forces which defeated the Scottish troops at Neville's Cross (q.v.) in 1346. Philippa was mother of Edward, the Black Prince. She was a patron of Froissart and was very popular among the English common people. Queen Philippa is notable because she aided in maintaining and strengthening that close connection of England and Flanders which was so important for English commerce. Queen's College (q.v.), Oxford, was named in her honor. Consult: William Longman, *Life and Times of Edward III* (2 vols., London, 1869); T. F. Tout, *History of England, 1216-1377* (ib., 1905); K. H. Vickers, *England in the Later Middle Ages* (New York, 1914).

PHILIPPE DE THAUN. See THAUN.

PHILIPPEVILLE, fê-lép'vel'. A fortified seaport and the capital of an arrondissement in the Department of Constantine, Algeria, 38 miles north-northeast of the city of Constantine, on the Gulf of Stora, between Cape Boujaroun

and Cape de Fer (Map: Africa, E 1). Laid out in 1838 by Marshal Valée, on the ruins of the ancient Russicada, it is one of the prettiest towns in Algeria, and thoroughly French in its character. Philippeville is the chief railway station for the Department of Constantine and is connected by steamer with Marseilles and Algiers. It has several public offices, a large hospital and dispensary, Roman Catholic and Protestant churches, a commercial college, secondary schools, a public library and museum, theatre, etc. It has a distillery, tanneries, and cork manufactures. In the vicinity at Filfila are iron mines and quarries of marble. The town is an important entrepôt of the commerce of eastern Algeria and the Sahara, and the country in the vicinity is picturesque and fertile, producing grain, tobacco, cotton, and fruits. Its fine outer and inner harbors of 125 acres are protected by two breakwaters. The total annual value of its imports and exports is \$21,000,000. Pop., 1901, 21,251; 1911, 27,137.

PHILIPPI, fi-lip'pi (Lat., from Gk. Φιλίπποι). A city in northeastern Macedonia (Map: Greece, F 3). It was named after Philip II of Macedon (q.v.), who conquered it from Thrace (previously it had been called Crenides, the place of fountains) and enlarged it because of the gold mines in its neighborhood. It was situated on a high hill on the southern edge of a great plain and about 9 miles from the coast, where was the harbor Neapolis. With the rest of Macedonia it fell under the Roman power in 168 B.C., and was joined to the District of Amphipolis. In 42 B.C. it was the scene of the battles between Brutus and Cassius on the one side and Mark Antony and Octavian (Augustus) on the other, which resulted in the defeat of Brutus and Cassius. In consequence of this victory Augustus subsequently made Philippi a Roman colony and conferred on its inhabitants the *jus italicum*, which exempted them also from the land tax. Here about 50 A.D. the Apostle Paul founded a Christian church, to which is addressed the Epistle to the Philippians. An epistle to the same church is also preserved among the writings of Polycarp. The ruins, which include remains of an amphitheatre and of a great temple, are called, in Turkish, Felibedjik.

PHILIPPI, fê-lip'pê, FELIX (1851-). A German dramatist, born in Berlin. He entered journalism, traveled much, and after about 1884 devoted himself almost wholly to the writing of plays, empty and sensational, drawing their subjects from contemporary scandals, lawsuits, anything looming big in the public eye, but always showing a fine mastery of stage technic. Ultimately he became one of the most popular dramatists in Germany. His best-known plays are *Wer war's?* (1896); *Das Erbe* (1898); *Das grosse Licht* (1901); *Das dunkle Tor* (1902); and among later ones are: *Der Herzog von Rivoli* (1906); *Die Ernte* (1907); *Alt-Berlin* (1912); *Die Sieger Rom* (1913).

PHILIPPIANS, EPISTLE TO THE. One of the letters of the Apostle Paul contained in the New Testament. The Epistle was written to the Christian church at Philippi of Macedonia, which was founded by Paul on his second missionary journey (cf. Acts xvi. 12-40), about 50 A.D. The church had been visited by Paul at least twice after its founding, and besides this he had kept in close touch with it through messengers. From the first Paul's relations to

this church appear to have been exceptionally close and peaceful. It ever remembered him with gratitude and contributed once and again to his needs (iv. 10-20).

The Epistle was written from Rome towards the end of Paul's first imprisonment there. His case seemed likely at last to be about to be adjudicated and the Apostle was hopeful of being acquitted (i. 7, 12-26; ii. 24). Some time during Paul's imprisonment the Philippian church had sent one of their number, Epaphroditus, to Rome with a gift for their beloved Apostle. Epaphroditus had remained in Rome to assist Paul and had fallen ill with a sickness that came near to proving fatal, but fortunately had recovered (ii. 26 ff.) and was about to return to Philippi.

Such were the circumstances in connection with which Paul wrote to the church, sending the letter by Epaphroditus. The letter is primarily a personal message written in an open, confidential spirit, dealing chiefly with matters of personal significance and only incidentally touching upon points of doctrine.

After the usual epistolary signature, address, and greeting (i. 1-2) we have (1) a somewhat extended thanksgiving and prayer (i. 3-11). Then (2) the Apostle passes to information (i. 12-26) regarding evangelistic work in Rome and also as to his own circumstances. This is followed (3) by exhortation (i. 27-ii. 18) to steadfast consistency (i. 27-30), to imitation of the mind of Christ as seen in his wonderful humiliation (ii. 1-11), and to serious concern regarding their own salvation. He next passes (4) to information once more, this time concerning the plans of Timothy and Epaphroditus (ii. 19-30), following this (5) by a solemn and earnest warning against false teachings (iii. 1-iv. 1). This is followed (6) by concluding exhortations, both personal and general (iv. 2-9), with grateful acknowledgment (7) of their generous remembrance of him (iv. 10-19). The Epistle closes with the usual doxology, salutation, and benediction (iv. 20-23).

This brief review of the contents of the Epistle reveals its very practical character. Even the famous Christological passage (ii. 1-11) is pervaded by a practical rather than dogmatic spirit, and was probably never intended by Paul as a formal dogmatic statement.

Critical doubts as to the genuineness of the Epistle to the Philippians are of so arbitrary and superficial a nature as to be hardly worthy of serious discussion. The attestation of the Epistle as Paul's is both early and abundant, and the internal evidence of the Epistle itself is of such a character as to satisfy every reasonable demand. This is the opinion of an overwhelming majority of scholars. There is not so much unity of opinion as to the time and place of composition, a respectable minority holding to the theory that Paul wrote the letter during his imprisonment at Cæsarea before his voyage to Rome; but this theory rests on no certain foundation and is losing favor.

Bibliography. The New Testament introductions, such as those of Weiss, Beyschlag, Holtzman, and especially Theodor Zahn (Eng. trans., Edinburgh, 1909) and James Moffatt (New York, 1911). Of commentaries, that by J. B. Lightfoot (London, 1894) is the most thorough. More recent discussions will be found in G. C. Martin, in the New Century Bible (New York, 1902); R. D. Shaw, *The Pauline Epistles* (ib.,

1903); *The Expositor's Greek Testament* (ib., 1903); W. G. Jordan, *The Philippian Gospel* (ib., 1904); J. H. Jowett, *The High Calling* (ib., 1909).

PHILIPPICS. See CICERO; DEMOSTHENES.

PHILIPPINE (fil'i-plin, -pën, or -pîn) **ISLANDS.** An archipelago forming the most northern group of islands in the Malayan or Eastern Archipelago. It lies wholly within the tropics. The land surface extends between lat. 21° 10' and 4° 40' N., 1150 statute miles; the east and west limits are long. 116° 40' and 126° 34' E., making about 650 miles. The most northern land in the Philippines is Y'Ami Island, of the Batanes group, 93 miles south of Formosa; the most southern is Balut Island, of the Sarangani Islands, about 20 miles south of Mindanao; the most western is Balabac Island, about 40 miles north of Borneo; and the most eastern is Sancô Point, on the east coast of Mindanao. The archipelago is bounded on the west by the South China Sea, on the east by the Pacific Ocean, and on the south by the Sea of Celebes and the coastal waters of Borneo.

The archipelago numbers 3141 islands, of which 1668 are listed by name and 1473 are not named; 2775 of the islands contain less than 1 square mile. The coast line is for the most part so intricate that with one twenty-fifth the area of the United States it has more than double its coast line. Luzon and Mindanao are classed among the larger islands of the world, and nine others, Samar, Panay, Negros, Palawan (Paragua), Mindoro, Leyte, Cebû, Masbate, and Bohol, are of primary geographical importance. The rest are mainly dependent islands or islets along the coast of the larger islands or subordinate archipelagoes like the Sulu Islands. The area of the total land surface including the Sulu Islands is estimated at about 115,026 square miles, or a little less than the New England States, New York, and New Jersey together. Luzon (40,969 square miles) and Mindanao (36,292 square miles) comprise about seven-tenths of the total land surface, the area of the other leading islands being: Samar, 5031 square miles; Negros, 4881; Panay, 4611; Palawan, 4027; Mindoro, 3851; Leyte, 2722; Cebû, 1762; Bohol, 1441; and Masbate, 1236. The total water surface within the limits occupied by the archipelago is 705,115 square miles.

Topography. The Philippine Islands rise from a submarine platform less than 100 fathoms below the sea level, which is a north-eastern arm of a more extended plateau lying between Siam, Sumatra, Java, and Borneo. The platform surrounds the Sulu Sea, which descends to oceanic depths and is connected with the Borneic platform by the Palawan and the Sulu banks. Wallace's line, based on the biological features and separating Asiatic from Australian forms, lies close to the east of the islands. The submarine ridges are extended throughout the archipelago in the form of mountain ranges, from south to north, and form a large part of its relief. From the south coast of Mindanao to the north of Luzon the mountains are disposed in a line with or parallel to the trend of the platforms. The topography of the islands of the second class is simple. Each is traversed by a mountain range down its length, such as Leyte, Cebû, Negros, and Palawan, while on Panay the range closely borders the coast and Samar and Bohol are made up of hills with lit-

the appearance of system. The two great islands, Luzon and Mindanao, present greater variety of surface, with broad plains and level valleys, although in general there is comparatively little level land. The east coast of the former is bordered for 350 miles by a high, continuous mountain range, the Sierra Madre, from the northeast point nearly to the latitude of Manila. This range is seldom less than 3500 feet high, and occasionally peaks rise to 4500 feet. West of this is the great and fertile valley of Cagayan River, where is grown most of the tobacco of the archipelago. Between this valley and the coast of the China Sea are the Caraballos occidentales, a very complex range, culminating in Mount Dana, 7364 feet. Farther south a great plain or valley stretches from Lingayen Gulf to Manila Bay, bordered on the west by the Zambales Range, 4000 to 5000 feet high. The southern part of the island is broken by numerous short ranges and volcanic peaks. The Pacific coast of Mindanao is bordered by a high and continuous range, west of which is the valley of Agusan River, 40 to 50 miles wide. Then succeed several ranges, on one of which stands the extinct volcano, Apo, 10,312 feet, the highest point in the archipelago, beyond which to the westward is the valley of the Rio Grande de Cotobato, the lower valley of which is very broad and fertile.

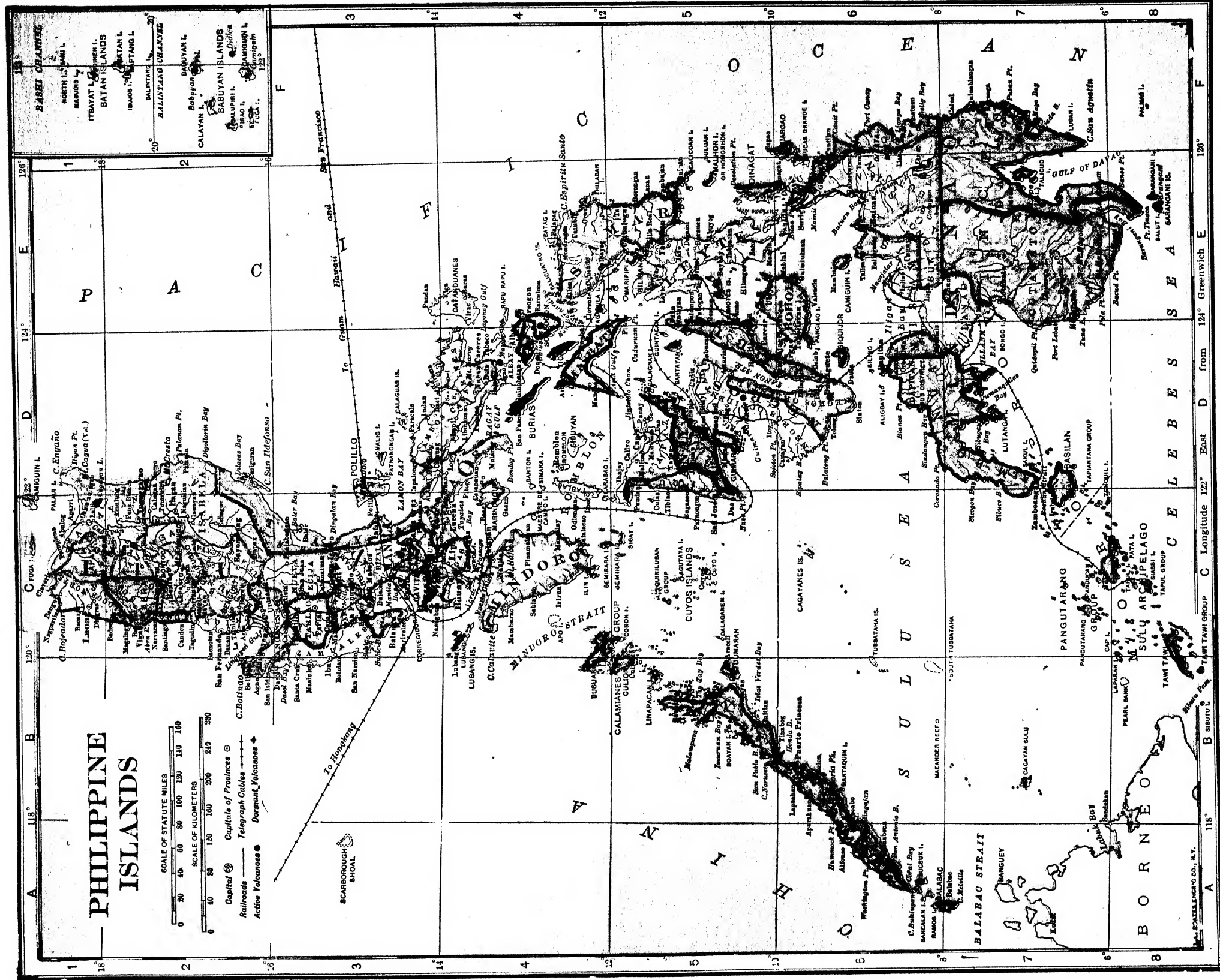
Hydrography. In the smaller and narrower islands the mountain chain which is the backbone of each island is the great central water parting, streams flowing to the sea on either side of it in short, straight courses. The drainage of the larger islands is more complicated, the parallel arrangement of the mountain chains giving space for the development of considerable streams. Among them is the Rio Grande de Cagayan (q.v.), Luzon, with a drainage basin of 10,000 square miles, or one-fourth of Luzon. This river is the largest on the archipelago, being some 220 miles long. All the interior waters of northeast Luzon are tributary to the Cagayan, reaching the China Sea on the north coast of the island. Most of the interior waters of central Luzon, south of the Cagayan basin, are included in the systems of the Agno and the Pampanga, which empties through a wide delta into Manila Bay, and of Laguna de Bay and the Pasig River. The mountains are so near the sea in east Luzon that the rivers of that coast are of small importance, excepting the Bicol in the southeast, which floats small vessels; but in the northwest the Agno has 11 feet of water on its bar at high tide, which gives some importance to the port of Dagupan at its mouth. The Pasig is only 12 miles long, but, as it connects Laguna de Bay (q.v.) with Manila Bay through the chief port of the island, it is a commercial highway of importance. The river systems of Mindanao, confined to a considerable extent within the parallel ranges, have chiefly a north and south direction and are more important for navigation than those of Luzon. The Rio Grande de Cotobato, one of the largest rivers in the Philippines, drains the central basin of the island, carries the waters of many tributaries to the Celebes Sea on the west coast, and is navigable for gunboats as far as Lake Liguasan. The Rio Agusan (q.v.) rises about 25 miles from the south coast and reaches the sea on the north coast, nearly dividing the island. It is navigable for a few miles from its mouth. The most important lakes in Luzon are Laguna de

Bay, 25 miles long and 21 miles wide, which receives numerous small streams from the mountains around it, and Bombon or Taal, 14 by 11 miles in extent, Taal volcano rising amid its waters. The largest lakes of Mindanao are the system of Buluan-Liguasan, in the centre, and Lanao, near the north coast. Smaller lakes are scattered over the islands.

Climate. As the archipelago is wholly within the tropics, the climate is warm. Its insular situation, its proximity to the great continent of Asia, its low latitude, and its topography explain its peculiarities of climate. From November to June the northeast trade wind prevails, and consequently the east coasts have a heavy rainfall, while most of the rest of the archipelago, being protected by the east-coast ranges, is comparatively dry. During the remaining four months the southwest monsoon prevails, producing a rainy season over most of the archipelago, while the east coasts are comparatively dry. The average annual rainfall of Manila, covering a period of 32 years, is 75.43 inches. At Manila, which in temperature fairly represents the archipelago, the cool season (November, December, January, and February) has a mean monthly temperature ranging from 75° F. to 80° F.; in the warm season (March, April, May, and June) the mean monthly temperature ranges from 81° F. to 84° F., and in the wet season (the four remaining months), 79° F. to 81° F. The highest temperature recorded at Manila, and recorded but once in recent years, is 100° F. in May, and the lowest 60° F. in January, an extreme record range of only 40° F. The range of temperature through the day is slight. The relative humidity is not high except in the wet season, when it approaches saturation all the time. The rivers often overflow their banks during the wet season, and wide areas in the larger islands are submerged, but the floods are not feared so much as the cyclonic storms of wind and rain known as typhoons, which seldom occur south of lat. 9° N., but north of that line sometimes destroy the lives of thousands of persons and wreck many vessels and villages. The typhoons, which are similar to the hurricanes which devastate the Atlantic coast of the United States, are most frequent in July, August, September, and October, when these whirling winds from the Pacific occasionally sweep the whole archipelago north of Mindanao. The most terrific of these storms recorded in the Philippines struck Manila in 1882, traveling at a velocity of 140 miles an hour.

Flora. The vegetable life is rich and varied, with very few distinctive species, but some plants that are transitional between the flora of Formosa on the north and Borneo on the south. A great variety of tree life is found on the islands; the Philippine Forestry Bureau reports 747 species of wood brought to market, and the number of useful woods is undoubtedly much larger. It is estimated that 80,000 square miles, or 70 per cent, of the archipelago is forest-covered. Woods suitable for the finest cabinet-work, for veneering, and for artistic purposes are abundant. Gutta-percha and India-rubber trees abound. Many trees are so hard that they cannot be cut by the ordinary circular saw. The bamboo grows in numerous varieties and, as in other parts of the Malayan Archipelago, is indispensable to the natives. The cocoa palm flourishes everywhere, and many of the ripe nuts

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are collected in rafts and floated to market. The oil is used in cooking and as an illuminant. Other palms are very numerous. The banyan is common and grows to enormous dimensions, and the cinnamon, clove, and pepper are found wild in the southern islands. About 1200 genera and 5000 species of plants have thus far been recognized by botanists. Economically the most valuable of the wild plants is Manila hemp, the fibre of a wild plantain (*Musa textilis*). The plant closely resembles the edible banana in appearance and grows best on shaded hillsides at moderate elevations. The crop is raised on plantations, which yield, when carefully managed, an annual return of 30 per cent on the capital invested, but notwithstanding the large area devoted to the cultivation much of the exported product is gathered wild. This condition, however, is rapidly changing. This fibre is not successfully raised elsewhere except on a few plantations in North Borneo. Practically all the cultivated plants of the South Asian island world are successfully raised, including rice, sugar, tobacco, coffee, cacao, maize, and sweet potatoes.

Fauna. The islands are poor in indigenous mammals; altogether there are but 23 species of mammals on the islands. The most important animal is the carabao or water buffalo, which is caught young, tamed, and universally employed as a draft animal, while his tough flesh is valued by the natives as meat. He is usually docile, but is slow and lazy and during the heat of the day will not work more than two hours at a time without his mud bath. The female gives abundant milk, from which ghee, a kind of butter, is made. The hide makes valuable leather. The timarau, a small buffalo living in the jungles of Mindoro, has never been tamed; it often attacks and kills the larger carabao. A small humped variety of cattle are raised in large numbers for beef on some of the islands. Goats are common and are utilized both for milk and flesh. There are several species of deer, and both wild and domesticated hogs are very abundant. The larger horse, as known in America and Europe, does not thrive, but the Philippine pony, originally from Spain, is an excellent saddle horse and useful in teams as a carriage horse, but not strong enough for heavy work. The carnivora have no large representatives, and only a small wild cat, two species of civet cats, and the binturong are conspicuous. The islands have nearly 600 species of birds, among which are the jungle fowl, hornbill, fruit pigeon, the snipe, curlew, and other waders, also the species of swift whose nests (edible birds' nests) are highly esteemed in China as an article of food. Marine fish are far more important than fresh-water fish and form the largest part of animal food, the natives also eating many varieties of shell fish. The pearl oyster, yielding a considerable quantity of shell and jewels, is fished in the Sulu Archipelago. Crocodiles and snakes are abundant. Swarms of locusts sometimes devastate the fields, and rice and tobacco have other insect enemies.

Geology. The geology of the archipelago has not yet been systematically studied. In broad outline the islands appear to consist of ancient eruptive rocks that have been covered by volcanic outpourings of the Tertiary, Quaternary, and present epochs, and in the lower levels by alluvium. There are 12 volcanoes which have

been in eruption within historic times. The most famous among them, and perhaps the most beautiful volcanic cone in the world, is Mayón, near the Bay of Legaspi, in southeastern Luzon. Mayón is 7916 feet in height, and some of its eruptions in the past three centuries have been very serious. The surrounding country has been well-nigh buried under its streams of lava, and its clouds of volcanic dust have been carried through the air as far as the coast of China. Another remarkable volcano is Taal, which is an island in the middle of Lake Bombon, Luzon, with an area of 220 square miles, built up from the bottom of the lake by the outpouring from several craters. In January, 1911, this volcano exploded, attended by a remarkable electrical display visible for 250 miles. Over 1300 people are known to have been lost, and mud and ash were over an area some 1200 square miles in extent. The archipelago is a centre of seismic as well as volcanic energy, and the volcanic centres are often the sources of the severest earthquakes. Most of the very violent shocks from which Manila has suffered, e.g., have radiated from the Taal centre. Other regions subject to earthquakes lie about Mayón, on the island of Masbate, and along the north shore of Luzon. For the 18 years 1880-97 there was an average of 53.4 earthquake days in the year, or 4.5 per month, while 796 earthquakes were recorded between 1902 and 1908.

Mineral Resources. The mineral resources of the islands are diversified, but so far little developed. Already 113 mineral species and varieties have been classified, and coal and gold are found in almost every island of the archipelago. The latter mineral has for years been obtained in small quantities by Filipinos, but because of primitive methods and equipment only shallow alluvial and free-milling surface ores have been accessible. Spanish explorers were quick to discover and take advantage of this resource in the Philippines, but the best Spanish records indicate that mining was carried on with more energy before the Spanish Conquest than it was afterward. Early in the seventeenth century the production from one district near Paracale-Camarines was about \$200,000 per year.

The principal gold-mining districts are the Baguio and Lepanto regions, in the Mountain Province, the Aroroy district, Masbate, the Paracale district, Camarines, and the Cansuran district and Mindanao. The first two districts are the lode, and the last two the placer, gold districts. The total gold production has advanced from less than \$170,000 in 1907 to \$1,125,000 in 1914.

The quality of coal ranges from black lignite to semianthracite. Conservative examination shows that there are "in sight" at least 35,000 tons of lignite and 1,000,000 of subbituminous coal. The production of coal has declined since 1909, when 36,336 metric tons were produced. In 1913 there was no commercial production; the only activity in coal mining was on the island of Cebu. Coking coal occurs in Cebu and Bulacan provinces, but it has not proved economically important.

Silver is found alloyed with gold in practically all of the gold deposits, in the ratio of one part of silver to four parts gold. There are high-grade copper deposits in Benguet, Pangasinan, Batangas, Mindoro, Masbate, Panay, and Mindanao. Valuable deposits of high-grade hematite and magnetite are found in the eastern and south-

eastern cordilleras of Luzon. These deposits are undeveloped, but the ore occurring as boulders on the surface of the ground in Bulacan and Rizal provinces amounts to 5,000,000 tons. The iron produced by natives amounts to about 140,000 metric tons annually. Other minerals and metals which occur in the islands are Portland cement, lime abrasives, asbestos, gypsum, petroleum, salt, stone, sulphur, sand, and gravel. The total value of the mineral products in 1913 was 3,944,581 pesos.

Agriculture. It is estimated that less than half the agricultural lands are in cultivation, and the development of this area has been restricted by lack of knowledge of proper agricultural methods. The American government since its occupation has made systematic efforts to improve these conditions. There are six government agencies giving instruction in agriculture or engaged in agricultural development.

The most important strictly agricultural product is sugar; in 1913 there were 435,200 acres of land under cultivation in sugar cane, representing about one-half of the land suitable for this crop. In some localities the massive granite rolls imported from China are still used. In 1854 the sugar exportation from the Philippines exceeded 47,000 tons and constituted 33 per cent of the total exportation. From this time until 1890 the industry gradually increased in importance until the average annual exportation for the four following years amounted to 200,000 tons, valued at \$7,500,000. A demand for a better grade of crude sugar resulted in the introduction of improved measures and methods for the making of centrifugal sugar. The first factory for the output of this sugar was built in 1907. The exportation of sugar in 1914 amounted to 236,498,001 kilos, valued at \$11,059,593. Approximately 75 per cent of this sugar, representing the better grades, was shipped to the United States and the remainder to China and Japan.

The growing of coconuts and the production of copra and coconut oils are agricultural industries of great importance. The Philippines export more copra than any other country. There are on the islands 45,000,000 coconut palms. These are widely distributed, but the majority are south of the city of Manila. All the coconut not intended for direct consumption as food is made into copra, which is coconut meat partly dried, or into oil. Copra is made at an extremely low cost of operation, the development of this industry is comparatively recent. There were exported, in 1914, 87,344,000 kilos, valued at about \$8,000,000. It is estimated that not less than 150,000,000 nuts are consumed annually for food in the islands.

Abaca (Manila hemp) is not only the most important fibre, but also the most important export product of the Philippines. For a number of years it comprised approximately two-thirds of the total export trade of the islands. The principal production for export did not commence until 1888, when 41 tons were exported. Abaca is distributed throughout the greater part of the Philippine Archipelago. During the fiscal year ending June, 1913, the total area cultivated was 909,849 acres. This production was distributed among Albay, Ambos, Camarines, Sorsogon, Leyte. Until recently in the production of abaca the old and crude methods of fibre extraction were used. Since 1903 several large plantations have been established in different

localities, and improved methods in the cultivation of the plant and in the general management have been adopted. There were exported, in 1914, 116,886,575 kilos of hemp, valued at \$19,104,815.

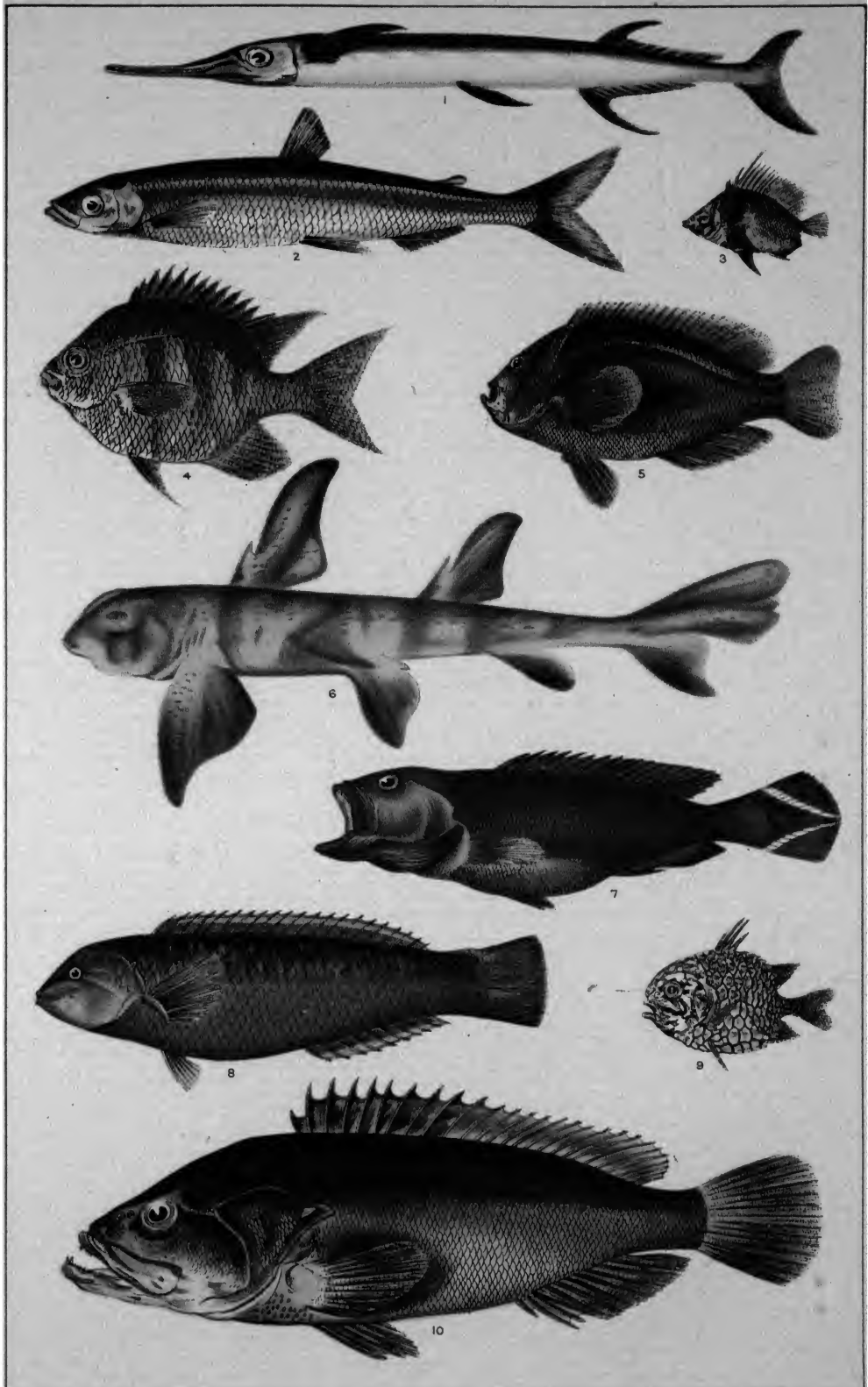
Rice is the staple food of the Philippines and is grown in every province. The prevailing system is single cropping, with little or no attempt to restore the fertility of the soil. In most sections but one crop is produced annually, but in a few restricted areas favored with a more distributed rainfall and by the aid of irrigation two crops per annum are grown. Prior to the eighties there were several annual crops of rice, so that it entered into the list of exportations. Since that time importations have been necessary to meet the home demand. The development of the sugar and hemp industries and the demand for labor for railway building and public works have encroached upon the labor supply available for rice production. Another important factor is the lack of work animals.

The growing of tobacco is one of the oldest industries of the Philippines, and Manila cigars are perhaps more widely known than any other production of the islands. The growing of tobacco did not assume the proportions of an industry until 1781, when Governor-General Vasco decreed that the government should have control of the production, manufacture, and sale of this product. By this decree a monopoly was created which remained in operation for 100 years. The monopoly strictly supervised the growing and grading of the leaf and had factories in Manila for the manufacture of cigars, cigarettes, and smoking tobacco. Through the strict enforcement of regulations, especially in the earlier period of its operation, the monopoly secured for the tobacco an enviable reputation for quality. Dissatisfaction in its management finally resulted in the dissolution of the organization. The tobacco monopoly throughout its entire period was the chief source of income for the government. While tobacco is grown in almost every province, the greatest areas devoted to the industries are in Isabela, Cagayan, Pangasinan, Cebu, and La Union, which contain 78 per cent of the total area planted with tobacco and produce about 84 per cent of the crop. There were exported, in 1914, 13,085,442 kilos of manufactured tobacco, valued at \$1,757,824. Cigars exported in the same year numbered 154,753,363, valued at \$2,315,723. It is estimated that 4,500,000,000 cigarettes are consumed in the islands annually. On these the consumers pay to the government approximately \$2,250,000 as internal-revenue tax.

Other agricultural products of greater or less importance are vegetable oils, tanning materials, cacao, and coffee. The latter product was formerly a prolific source of revenue for the people of Batangas and neighboring provinces, but the lack of information regarding the pests of this plant and the consequent neglect to protect it from insect and other diseases have caused it to be absolutely abandoned. Coffee grows most luxuriantly in Bontoc, Benguet, Ilocos Norte, and Agusan provinces; practically all is consumed in the islands.

Live Stock. The carabao is the most important domestic animal, and the Filipino hog is second in importance. The great need of the live-stock industry is better breeding and better care. There are large and important areas

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- 1 GREAT CAR - (TYLOSURUS GIGANTEUS)
- 2 SMELT - (HYPOMESUS JAPONICUS)
- 3 FLAG-FISH - (HENIOCHUS MACROLEPIDOTUS)
- 4 A DEMOISELLE - (GLYPHIDODON TRIFASCIATUS)
- 5 AMPHIPRION FRENATUS

- 6 PORT JACKSON SHARK - (HETERODONTUS PHILIPPI)
- 7 A GROUPE - (EPINEPHELUS URODELUS)
- 8 FOUR-COLORED WRASSE - (JULIS QUADRICOLOR)
- 9 CONE-FISH - (MONOCENTRIS JAPONICUS)
- 10 A SEA-BASS - (EPINEPHELUS MARGINALIS)

in Mindanao and many other small areas well adapted to the raising of cattle, carabao, and ponies. The live-stock industry has suffered from rinderpest and other diseases. It is estimated that from 1910 to 1915 the total loss from rinderpest was 2,528,900 pesos. In 1902 the loss from rinderpest was between 50,000,000 and 60,000,000 pesos. Many of the provinces lost from 50 to 80 per cent of their carabao and cattle. The Bureau of Agriculture has suppressed the disease by quarantine and other measures for many years. It is probable that under present conditions the disease will not be entirely stamped out, since the lands in the islands are unfenced and animals cannot be easily quarantined, and because of prejudice on the part of the owners against the quarantine regulations. Immunization has been employed with success, and it is probable that this will prove the best solution of the problem.

No census of the live stock has been taken since 1903. In that year the neat cattle numbered 770,000, horses about 145,000, sheep about 30,000, goats about 125,000, swine about 1,180,000, and poultry about 5,565,000.

Forest Products. The virgin forests of the islands cover about 40,000 square miles, about one-third of the total area, approximately equal to the area of the State of Kentucky. In addition there are estimated to be 20,000 square miles of second-growth forest which will yield large quantities of lumber and firewood. More than 99 per cent of the timber belongs to the Philippine government and is under the administrative control of the Bureau of Forestry. About 70 per cent of all the timber belongs to the dipterocarp family. The largest of this family reaches 200 feet in height, and some specimens have a diameter of 7 feet. About a dozen botanically distinct species furnish about 80 per cent of the entire cut. This number can be reduced to three groups, the lauans, apitongs, and yacals. The main wealth of the Philippine forests lies in the first group. It may be divided into two classes, the white and red lauans. Export grades of the red lauans are used in Europe and America as substitutes for mahogany and are frequently sold as such. While not so hard and durable as mahogany, this timber has a beautiful grain and permits of a very fine polish. The public forests are not sold, but are developed under the license system. The small operators usually work under area license for definite small areas. Exclusive license or concessions are usually for a period of 20 years and permit the holder to cut and extract timber and other forest products in a special tract. Among the minor forest products are nipa palm, which produces sugar and alcohol, rattan, resins, gums and oils, gutta-percha and rubber. The various forms of bamboo found in the Philippine Islands are probably put to more uses than any other single product. In addition to the domestic and industrial uses it is found that one kind of bamboo, carabaho, is an excellent material for paper pulp—the cost of production being lower than that of wood pulp, while the product is excellent.

Commerce. Foreign commerce has increased steadily under American rule; this is shown by the fact that the total trade in 1905 amounted to \$63,505,324, which increased by 1912 to \$116,591,201. In 1914 it fell to \$97,278,287, because of the European War. Approximately 50 per cent of the trade supply of the islands

in 1914 was with the United States; the export trade supply amounted to more than 50 per cent and the import trade to less than 50 per cent. The value of the import trade in 1914 was \$48,588,653. The export trade reached a higher mark during 1914 than during any year since 1899 with the exception of 1912. The exportation of sugar showed an immense increase not only in quantity but in value. Table I below shows the chief articles of the imports for

TABLE I

NAME OF ARTICLE	1914	1913
Agricultural implements, and parts of	\$35,440	\$33,573
Carabao*	66,557	2,666
Other cattle	241,766	165,938
Books and other printed matter	469,548	530,477
Brass, and manufactures of	227,886	254,232
Wheat flour	1,611,158	1,898,954
Other breadstuffs	434,006	605,505
Automobiles, and parts of*	1,013,451	1,263,402
Other cars, carriages, etc., and parts of	473,912	587,880
Cement	554,882	811,692
Chemicals, drugs, dyes, and medicines	723,791	719,080
Coal	1,749,745	1,584,067
Cotton, and manufactures of	9,956,244	11,844,301
Fish and fish products	720,735	845,780
Glass and glassware	293,319	318,271
Electrical instruments and apparatus	372,876	514,373
Phonographs, records, etc.*	36,469	51,351
Iron and steel, and manufactures of	6,983,444	8,613,904
Leather, and manufactures of	1,557,824	1,053,448
Meat products	1,866,274	2,053,250
Dairy products	1,118,273	1,211,265
Illuminating oil	1,281,020	1,268,044
Other oils	793,834	844,615
Paper, and manufactures of	757,190	819,437
Rice	3,276,148	3,164,591
Silk, and manufactures of	849,438	836,322
Spirits, wines, and liquors	350,052	395,567
Vegetables	795,339	779,955
All other imports	9,978,025	10,240,847
Total	\$48,588,653	\$53,312,786

* For half year only.

the fiscal years 1913, 1914, while Table II shows the chief articles of all exports and their value

TABLE II

NAME OF ARTICLE	1914	1913
Copra	\$7,980,270	\$9,545,724
Coconut cake*	118,812	109,575
Coconut oil	2,619,183	1,146,839
Hats	313,881	408,939
Hemp	19,194,815	21,121,084
Knotted hemp†	707,787	565,701
Magney	417,057	590,951
Shells:		
Black-lip pearl*	14,228	11,018
Gold-lip pearl*	143,608	208,317
Trocha*	118,257	37,931
Green snail*	66,238	118,525
Sugar	11,069,593	7,082,589
Tobacco		
Cigars	2,315,159	3,012,234
Cigarettes	39,723	47,915
Other tobacco	1,823,650	1,906,819
Lumber:		
Tanguili	167,849	143,020
Almond*	44,479	17,142
Other lumber	97,436	154,495
Pili nuts*	22,312	94,135
Pearl buttons*	61,117	38,673
All other exports	952,360	1,072,296
Exports of foreign merchandise	553,820	892,234
Total exports	\$48,689,634	\$47,772,956

* For half year only. † Not separately stated prior to July 1, 1913.

for the same period. Table III shows the total trade for the calendar years 1913, 1914, with the countries of origin and destination.

TABLE III

COUNTRY OF ORIGIN AND DESTINATION	1914	1913
United States	\$48,448,105	\$43,110,279
Hawaii	361,665	722,122
Porto Rico	10,344	12,382
Guam	90,182	7,186
United Kingdom	11,709,645	14,444,736
Japan	6,627,457	7,317,764
France	4,995,892	6,931,016
Germany	3,332,204	4,630,039
China	3,065,878	3,830,718
Hongkong	2,323,005	3,708,376
Spain	3,449,812	3,691,429
Australasia	3,027,901	3,295,001
French East Indies	8,139,745	7,719,921
British East Indies	1,901,441	1,992,366
Belgium	469,085	831,181
Switzerland	531,982	750,687
Italy	930,198	725,955
Dutch East Indies	609,613	487,244
Siam	345,518	477,330
Netherlands	465,620	470,405
Austria-Hungary	231,874	351,611
Japanese China	161,937	128,388
Norway	139,958	110,711
Canada	48,378	97,588
Denmark	82,644	84,474
French Africa	74,965	25,077
British Africa	23,332	1,640
All other countries	140,737	129,928
Total	\$97,278,287	\$101,085,742

Fisheries. Next to the agricultural products food fishes are of the greatest importance to the Filipinos. In Manila alone fresh fish to the value of over 5000 pesos are sold each day. About 1800 species in the Philippine waters have been identified, and with a few exceptions they are all used as food. Such fish as the anchovy, sardine, and herring abound and constitute a potential source of wealth. Game fish are found; among them the jewfish, bonieta, swordfish, and tuna. In the vicinity of Manila and in other localities are many ponds, which in many cases serve the twofold purpose of growing the market fish and providing salt for manufacture. Pearl shells to the amount of 292,211 kilograms, valued at 354,264 pesos, were exported in 1913. The pearl industries are proving to be a profitable investment for Japanese capital. The gathering of button shells, window oysters, and trepang (*bêche de mer*) are also industries of considerable importance. A large amount of shark fins is exported yearly to China, where it is dried and used for food. Specimens of good quality are found in the Moro Province. Large oysters grow native to the islands.

Manufacturing. Except for cigar and cigarette manufactories, of which there are some of the largest in the world, manufacturing has been largely confined to household industries, to the making of articles for domestic consumption, such as native cloths, hats, shoes, mattings, baskets, etc. The Philippine government is encouraging these household industries, particularly those of weaving, hat and basket making, and embroidering. (For manufacture of sugar, tobacco, and coconut, see *Agriculture*, above.) In 1912 the first modern mill for the extraction of coconut oil appeared, and the exports of this commodity have increased from 660 kilos, valued at \$40, in that year to 11,943,329 kilos, valued at \$2,619,183, in 1914. The manufacture of,

distilled spirits from palm sap is another important industry, the produce reaching 11,276,298 proof liters in 1914. Practically the entire output is consumed locally, and more than half of it is denatured and used for industrial purposes. The output of the lumber mills has increased from 176,758 cubic meters in 1908 to nearly 300,000 cubic meters in 1914. Public forest lands in the Philippines are about 60,000 square miles in area, two-thirds of which are virgin forest and are estimated to contain about 200,000,000,000 board feet of merchantable timber. (See *Forest Production*, above.) As this supply lies only a few days' sail from China, a country practically denuded of forests, this industry is expected to grow rapidly. Other minor manufactures are those of pearl buttons, umbrellas, shoes, soap, cordage, and vehicles.

Transportation and Communication. The Philippines are connected with the outside world by two lines of cable, one American and one European. Manila is a regular port of call for freight and passenger vessels of several steamship lines, connecting with San Francisco and Seattle in the United States, with Japanese, Chinese, and other Far Eastern ports, and with Mediterranean ports in Europe. Sailings to and from Hongkong are regular and frequent. The principal ports of the islands are connected by steamship lines having terminals at Manila. There are in operation about 732 miles of railroad, of which about 600 miles are in Luzon, 70 miles in Panay, and 60 miles in Cebu. Additional construction is under way in Luzon. Manila has an urban and suburban electric-railway system, operating about 40 miles of line. The construction and maintenance of highways are directly under the control of the central government and are being carried out on a comprehensive plan by experts. Already more than 9400 miles of public roads have been built, of which about 3000 miles are first-class, 2000 second-class, and the rest third-class.

Interisland telegraph service is furnished by about 1000 miles of land and about 2000 miles of submarine line. Excepting one line of cable operated by a corporation, and the wireless stations and a few short lines operated by the army and navy, the public-telegraph service, land, submarine, and aerial, is maintained by the Philippine government in connection with its postal service. There are in the islands about 600 post offices, about one-half of which are telegraph, cable, or wireless stations. Telephone service in the city of Manila is furnished by a public-service corporation. Outside of that city, where not furnished by the postal service, the lines are owned and operated by the provincial governments. There are about 1200 miles of telephone wire furnishing service to about 6000 stations.

Finance and Banking. The Philippine government has been self-supporting since its establishment by the Americans. Its revenues, derived principally from customs-import duty and internal-revenue duty, amounted to \$16,391,572.66 in 1913. Expenditures for the same year amounted to \$14,444,161.94. The Philippine government has a bonded indebtedness of \$12,000,000, \$7,000,000 of which was borrowed for the purchase of agricultural lands formerly owned by ecclesiastical societies, and the remainder to carry on public works, particularly harbor and port improvements at Manila, Iloilo, and Cebu. In addition the insular government

has guaranteed sewer and water-works bonds of the cities of Manila and Cebu in amounts of \$4,000,000 and \$125,000 respectively. It has also guaranteed as to the payment of interest some \$15,500,000 of railroad-construction bonds secured by mortgage on the property of the roads. Ample sinking funds have been provided by law for the retirement of the bonds of the central government and of the cities referred to.

The currency system of the islands is on a gold basis, the unit being the peso, equivalent to 50 cents in United States currency. On June 30, 1914, there was in circulation P18,412,000 in silver and P28,188,000 in silver certificates; also P5,433,520 in notes of the Bank of the Philippine Islands, making a per capita circulation of about \$3.41. There are in the islands four banks which engage in a general banking business. Their combined capital amounts to \$2,250,000. The Bank of the Philippine Islands at Manila with branches at Iloilo and Zamboanga is a domestic bank and the only one authorized to issue and circulate notes. The other three, which are foreign institutions having houses at Manila, are the Hongkong and Shanghai Banking Corporation with a branch at Iloilo, the Chartered Bank of India, Australia, and China with branches at Cebu and Iloilo, and the International Banking Corporation with a branch at Cebu. In addition to these, a savings and loan institution called the Monte de Piedad and Savings Bank is operated in Manila by ecclesiastical authorities.

The Agricultural Bank and the postal-savings system are operated by the Philippine government. The Agricultural Bank was established in 1908 to relieve farmers from the high rates of interest charged by private lenders. Loans are made only to persons engaged in agricultural pursuits and not in excess of 60 per cent of the value of the land or crops given as security. The postal-savings system was established in 1906. On April 30, 1915, it had 50,944 accounts, with deposits of \$1,656,046.86 in all. Of the depositors 43,158 were Filipinos, 5618 were Americans, and 1236 Europeans.

Weights, Measures, and Money. The archipelago is on a gold basis. The money in use, besides American gold, silver, and paper, consists of Filipino pesos of a guaranteed value of 50 cents, and subsidiary coins, with paper representatives. The metric system of weights and measures is officially in use, but Spanish and Malay denominations are also employed.

Population. A census of the Philippines was taken in the spring of 1903 by the insular government. This showed a total population of 7,635,426, of which 6,987,686 were civilized and 647,740 were wild peoples. The average annual rate of increase for 50 years was 1.1 per cent. The density of population was 67 per square mile. The estimated population on June 30, 1914, was 8,650,937. Manila, the capital and largest city, had in 1914 a population of 266,943.

The table herewith gives the area, population, and population per square mile by provinces and by islands for 1903.

The civilized people were divided almost equally as to sex. As to birthplace, 6,931,548, or 99.2 per cent, were native born. There were 41,035 Chinese (or 0.6 per cent), 8135 Americans, 3888 Spaniards, 667 British, and 368 Germans. About half of the foreign born were in Manila.

The average age of the people was but 23.9 years, which is 2.4 years less than that of the people of the United States. Only 2.4 per cent of the population was less than one year of age—a small proportion due, not to a small birth rate, but to a high rate of infantile mortality. Children under 5 years formed 15.1 per cent and those under 10 years 28.8 of the population, which were average proportions. Children of school age, 5 to 17 years, were 30.6 per cent, a little more than in the United States.

BY PROVINCES	Area in sq. miles	Population	Population per sq. mile
Albay	1,783	240,326	135
Ambos Camarines	3,279	239,405	73
Antique	1,134	134,166	118
Bataan	537	46,785	87
Batangas	1,201	257,715	215
Benguet	822	22,745	28
Bohol	1,511	269,223	178
Bulacan	1,173	233,742	191
Cagayan	5,052	156,239	31
Capiz	1,749	230,721	132
Cavite	619	134,779	118
Cebu	1,939	653,727	337
Ilocos Norte	1,380	178,995	135
Ilocos Sur	1,642	239,271	146
Iloilo	2,027	410,315	202
Isabela	5,018	76,431	15
La Laguna	629	148,606	236
La Union	634	137,839	217
Lepanto Bontoc	2,005	72,750	36
Leyte	3,008	398,922	129
Manila		219,928	
Marbata	1,569	43,675	28
Mindoro	4,024	39,582	10
Misamis	3,777	175,883	47
Moro	28,123	380,038	14
Negros Occidental	3,130	308,272	98
Negros Oriental	1,884	201,494	108
Nueva Ecija	2,169	134,147	62
Nueva Vizcaya	1,950	62,541	32
Palawan	5,238	35,696	7
Pampanga	568	223,574	258
Pangasinan	1,193	397,902	334
Rizal	733	150,923	206
Romblon	573	52,848	92
Samar	5,276	268,237	50
Sorsogon	755	120,495	160
Surigao	6,988	115,112	16
Tarlac	1,205	135,107	112
Tayabas	6,354	204,739	32
Zambales	2,125	104,549	49
BY ISLANDS			
Bohol	1,441	243,148	169
Cebu	1,762	592,247	336
Leyte	2,722	357,641	131
Luzon	40,969	3,798,507	93
Marinduque	352	50,601	144
Marbata	1,236	29,451	24
Mindanao	36,292	499,631	14
Mindoro	3,851	28,361	7
Negros	4,881	460,776	94
Palawan	4,027	10,918	3
Panay	4,611	743,646	161
Samar	5,031	222,690	44

As to conjugal conditions, 56.4 per cent were single, 33.1 were legally married, 8.3 were consensually married, and 7.2 were widowed. The proportion married, including the legal and consensual marriages, 36.4 per cent, was very large.

Of the population over 10 years of age, 55.5 per cent could not read and 79.8 could not write. The literates, i.e., those who could both read and write, were 20.2 per cent, or about one-fifth of the population over 10 years of age. The proportion of literates among males was much larger than among females.

The occupations of the Filipinos are few and simple in character. A very large proportion, 43.5 per cent of the inhabitants, are wage earners. The magnitude of this proportion is due to the large numbers of women workers. While

male workers were 57.6 per cent of all males, about the same as in the United States, the proportion of women workers was 23.4, as compared with 12.8 in the United States. Of the total number of wage earners, 41.3 per cent were engaged in agricultural pursuits, 0.8 in the professions, 18.8 in personal and domestic service, 7.5 in trade or transportation, and 31.6 in manufacturing or mechanical pursuits. From this it is seen that agriculture is far the most important of the Filipinos' occupations. The following table shows the proportion of all wage earners engaged in each of the principal occupations:

	Per cent
Farmers and farm laborers.....	40.7
Weavers and spinners.....	18.8
Day laborers.....	12.6
Merchants.....	4.5
Fishermen.....	3.8
Launderers.....	2.2
Seamstresses.....	2.2
Servants.....	1.8
Carpenters.....	1.3

Seven-eighths of all wage earners are accounted for in these nine occupations.

Education. To the problem of educating Filipinos of school age and older the American government has given most careful attention since the beginning of American occupation. Under the Spanish régime the provisions for elementary education, although excellent, were deficient in execution, and as a result little progress had been made in the education of the masses of people. Under American rule the Department of Public Instruction, with the director of education as the executive officer, is in direct charge of the educational methods. When schools were first started after the American occupation, the pupils presenting themselves for instruction were for the most part of the lower classes. In 1903 there were over 10,000 in intermediate and 6000 in secondary grades.

The total number of primary schools in 1914 was 3851. In these were enrolled 577,732 pupils. The average daily attendance was 392,094. There were 41 secondary and 309 intermediate schools. In the secondary schools were enrolled 6438 pupils, with an average daily attendance of 5546. In the intermediate schools there were 36,860 pupils, with an average daily attendance of 30,912. The total school population of the islands in 1912-13 was 1,256,046. In the schools for non-Christian pupils were enrolled 4680 male and 1130 female pupils. These schools numbered 129, and in them were employed 325 teachers.

At the beginning of the American occupation and for many years thereafter it was necessary to employ for the most part American teachers. The tendency has been to employ Filipino teachers as far as possible. There were 539 American teachers employed in 1914-15, while the Filipino teachers at the close of the year numbered 9300. Great advancement has been made in the average attendance and ability to teach among the native teachers.

Special efforts have been made in the direction of industrial education. The programme of industrial instruction, covering seven years of work, is four years of primary course and three years of intermediate courses. Instruction is provided in agriculture, domestic science, needlework in its finest forms, weaving of Philippine fibres, and work in wood, iron, and clay. In 1913, 736 teachers gave their entire time to industrial work, and in that year the average

school in the Philippines, except 37 schools offering secondary education, gave industrial work in one form or another. In that year 19,998 boys were taking trade and shop-work courses, 113,640 boys were engaged in farming and gardening, 12,996 girls were taking the gardening work, and 83,193 girls were studying household and housekeeping arts. There were, in 1914, 19 provincial trade schools, and in addition to these 280 intermediate-school shops, in which over 200 pupils took the regular trade courses and over 7000 pupils received some instruction in wood-working. Certain schools depend on the insular government for support. These are termed insular schools and include the Philippine Normal School, the Philippine School of Arts and Trade, the School of Household Industries, the Philippine School of Commerce, and the School for Deaf and Blind. The new Philippine Normal School building was completed at Manila in 1914. In this institution prospective teachers annually receive instruction along the lines of advanced academic work, basketry, hat making, fine needlework, lace making, and domestic science and economy. The Philippine School of Arts and Trade at Manila is the largest trade school and sends out each year a large number of skilled and experienced workmen. The Philippine School of Commerce offers a four years' course in business and clerical subjects. The School of Household Industries, established in 1912, trains women in certain selected home industries, particularly lace and embroidery. Upon returning to their home towns graduates establish centres for the production of high-grade needlework. The total expenditure for education for the fiscal year ending June 30, 1914, was 4,080,055 pesos. See PHILIPPINES, UNIVERSITY OF THE.

Health and Sanitation. Since the American occupation of the Philippines the improvement in health conditions and in sanitation has been one of the most serious problems. The result of the efforts that have been made is indicated by the fact that in 1913 there were 60,000 less deaths than in 1906. This reduction has occurred almost entirely among the preventable diseases. In spite of improved conditions there are annually more than 100,000 deaths from tuberculosis, malaria, beriberi, and intestinal diseases, all of which are preventable. It is estimated that malaria alone is responsible for at least 25,000 deaths annually.

Under the administrative jurisdiction of the Bureau of Health are the general and special government hospitals, the medical care of the civilian employees, and the operation of the food and drug acts. Prior to the American occupation nearly all the charitable work, even to the taking care of the lepers, was carried on by Roman Catholic orders. Many important Church institutions still exist and continue to do excellent work. The Protestants have also established hospitals, free clinics, and a home for orphans. Aid is given to many private societies for the prevention of tuberculosis and other diseases. The Philippine General Hospital, at Manila is one of the most modern institutions in the Eastern Hemisphere. There is also a system of provincial hospitals.

The segregation of lepers, with the view of the final extermination of the disease, was begun in 1906, but it was not until 1911 that anything like a complete collection of all the lepers was made. At the close of the fiscal

PHILIPPINE ISLANDS



STREET SCENES IN THE PHILIPPINE ISLANDS
1. MALASIQUI 2. SAN CARLOS

year 1913 there were in the colony 3298 lepers, of whom all but 23 were Filipinos. The number of lepers is gradually decreasing. The bubonic plague has been practically stamped out, and in the fiscal year ending 1913 only two cases were reported. Progressive measures for the eradication of mosquitoes resulted in greatly improved conditions in Manila.

The annual birth rate in the various provinces during the half year ending June 30, 1913, was 4.06 per thousand. The total number of births was 138,578. The total number of deaths in the same period was 68,598. In Manila the annual birth rate in 1913 was 35.33 per thousand, and the death rate 23.18.

It may be said, on the whole, that the health of the natives is good, but the climatic conditions are not favorable to long residence by Americans or Europeans. Relief may be obtained during the hot season by such of these as are able to remove to the mountains. The best known of these asylums is the elevated plateau of the Benguet, 150 miles north of Manila. In this plateau has been built the so-called summer capital Baguio.

Religion. Under the treaty of peace of Dec. 10, 1898, religious freedom is guaranteed to all the civilized people of the islands are Roman Catholic. Most of the parishes were administered by Spanish friars of the Dominican, Franciscan, and Augustinian orders, assisted by many native priests in the small parishes and missions, and since the American occupation several priests from the United States have been appointed to bishoprics. The Moros, living in the south, and the pagan wild tribes of the mountains are the leading non-Christian classes.

Government. For a time after the transfer of the Philippines to American control the islands were held under military government subject to the orders of the President of the United States. In January, 1899, a Commission was appointed by the President to aid in the humane and pacific extension of United States authority throughout the islands and to investigate and report upon conditions. In April, 1900, the President appointed a second Philippine Commission to continue and perfect the work of organizing and firmly establishing the government already begun by the military. On Sept. 1, 1900, this body began to exercise the legislative power and to appoint officers under the judicial, education, and civil-service systems, and later in municipal and provincial governments, the military government remaining supreme in any given territory until the Commission assumed jurisdiction. A municipal code was enacted Jan. 31, 1901, and was gradually applied to most of the towns inhabited by civilized Filipinos. It provided an electoral system, the exercise of the franchise being limited to male citizens of the Philippine Islands, 23 or more years of age, who had held certain municipal offices under Spanish rule, or owned real property worth \$250, or annually paid at least \$15 of taxes, or spoke, read, or wrote English or Spanish. Municipal authorities were given local autonomy except for supervision over their expenditures. The treasurers were appointed, but all other municipal officers were elected. Municipalities were later grouped in provinces organized under a provincial government act. Each province had an elective governor, chosen by the municipal councilors, a

treasurer, and a supervisor or engineer officer, both appointive, the three constituting a provincial board with certain limited powers. The provincial offices were all filled by appointment in the first instance. Later two or more provinces were grouped in districts over which a single engineer officer exercised supervision, and provision was made for elective third members of provincial boards.

Filipino towns in a few backward provinces, and all settlements of the non-Christian inhabitants of such provinces, were at first organized under special acts, from which were afterward evolved a township government act and a special provincial government act, the latter applicable to all of the provinces inhabited chiefly by non-Christians, except the Moro Province, which was organized under a law of its own. In 1914 the Province of Agusan was added to the Moro Province, and the designation Department of Mindanao and Sulu was given to the resulting territorial division.

The change from military to civil rule was brought about gradually by cooperation between the civil and military officials. On July 4, 1901, Judge William H. Taft, President of the Commission, was inaugurated as civil governor with jurisdiction over the provinces in which civil government had then been established, and thereafter the authority of the military governor terminated in each province upon the application to it, by the Commission, of the provincial government act.

On Sept. 1, 1901, a complete civil central government was established by the creation of four executive departments in charge of secretaries. Commissioner Worcester was made Secretary of the Interior, Commissioner Wright Secretary of Commerce and Police, Commissioner Ide Secretary of Finance and Justice, and Commissioner Moses Secretary of Public Instruction.

There followed the establishment of the necessary administrative bureaus and offices. Their number has been subject to modification. In December, 1914, they were the Executive Bureau, the Bureau of Audits, the Bureau of Civil Service, the Bureau of Health, the Bureau of Lands, the Bureau of Science, the Bureau of Forestry, the Weather Bureau, the Philippine Constabulary, the Bureau of Public Works, the Bureau of Posts, the Bureau of Coast and Geodetic Survey, the Bureau of Labor, the Bureau of Justice, the Bureau of Customs, the Bureau of Internal Revenue, the Bureau of Education, the Bureau of Agriculture, the Bureau of Prisons, the Philippine Library, the Bureau of Supply, the Bureau of Printing, the University of the Philippines, and the Board of Public Utilities Commission. Three Filipino members were added to the Commission on Sept. 1, 1901, and a fourth on July 6, 1908. It remained the sole legislative body until the inauguration of the Philippine Legislature on Oct. 16, 1907, and prior to that date enacted a comprehensive code of laws for the government of the islands. On June 11, 1901, it passed an act reorganizing the judicial system by establishing a supreme court of seven justices appointed by the President, and 16 courts of first instance with judges appointed by the civil governor subject to confirmation by the Commission. The Chief Justice and two justices of the Supreme Court were, and still are, Filipinos. A majority of the first appointees to judgeships of first instance were

Americans. This condition was gradually changed as competent Filipinos became available, and they are now in the majority. Peace courts were also provided and granted proper jurisdiction. Their justices, practically all of whom were Filipinos, were at first paid from fees. The system was unsatisfactory until fixed salaries were authorized, since which time it has been greatly improved. A special government was provided for Manila under an alcalde or mayor, with an appointive municipal board of three members. The latter have since been made elective.

The important Act of July 1, 1902, approved and confirmed the orders of the President for the establishment of civil government and provided a comprehensive system of government. Citizenship was defined as including all inhabitants of the Philippines who were subject to Spain residing in the Philippines when the treaty with that country was ratified on Feb. 8, 1899, who had not elected to retain their Spanish citizenship. The substance of the bill of rights of the Federal Constitution, except the right to bear arms and the right to trial by jury, was extended to the Philippines.

This Act directed the President of the United States to have a census of the islands taken upon certification by the Commission that a state of general and complete peace had been established, and provided for election two years later of members of a legislative Lower House, called the Philippine Assembly. The Commission was then to constitute the Upper House, and the two Houses were to form the Philippine Legislature, with jurisdiction over all territory in the islands save that inhabited by Moros or other non-Christian tribes, which was to remain under the exclusive legislative control of the Commission. The Philippine Assembly was to be composed of elective members distributed among the regularly organized provinces according to their population, with the proviso that each such province should have at least one delegate, the special government provinces, inhabited largely by non-Christians, not being represented at first. Two of them were subsequently granted representation. The qualifications of electors were made identical with those required in municipal elections. The Legislature holds yearly 90-day regular sessions and may hold special sessions of not more than 30 days each.

The Act of July 1, 1902, further provided for the choice by the Legislature at its first session, and biennially thereafter, of two resident delegates to the United States. They have the privilege of the floor of the House of Representatives, but are not entitled to vote.

The judicial system established by the Commission continued in effect. The United States Supreme Court was given appellate jurisdiction over all judgments of the Philippine Supreme Court involving more than \$25,000 or in which the constitutionality of any right or title claimed under the authority of the United States is in question. The Governor, Vice Governor, members of the Commission, secretaries of departments, and justices of the Supreme Court are appointed by the President, with the advice and consent of the Senate. Congress reserves to itself the power to annul all laws passed by the Philippine Legislature. The insular government was authorized to issue bonds and to purchase certain lands belonging to reli-

gious orders in connection with which a serious agrarian problem had arisen. Provisions were prescribed controlling the issuance of municipal bonds and the granting of franchises. The coinage of money by the insular government was authorized and provided for. The Division of Insular Affairs, organized by the War Department, was continued as the Bureau of Insular Affairs, to which were assigned all matters pertaining to civil government in the island possessions of the United States and subject to the jurisdiction of the War Department.

Ethnology. The first inhabitants of the Philippine Archipelago were doubtless the pygmy blacks, generally known as Negrito. This name was first applied to them by the Spaniards because of their diminutive size and color, which varies from a chocolate brown to a very dark sepia, and also because they resemble the negro race in other respects. Their hair is woolly; noses flat, broad, and spreading; chins feebly developed; lips thick, but not so protruding as in the African negro. Their heads are short and bullet-shaped. In size the men average 4 feet, 9 inches and the women 4 feet, 6 inches.

There is sufficient evidence that this race once occupied the entire archipelago, but it is equally certain that they were never a powerful people. From the earliest times they were broken up into small nomadic bands, each under the leadership of a local chief or headman.

In hunting they made use of bows and arrows, and blowguns. Fire for cooking was obtained either by rubbing a bamboo saw across a grooved section of the same material until the friction produced a spark or by sawing a rattan band between bark cloth and a soft piece of wood.

Following the pygmies came a people of Malayan blood, larger of frame, keener of intellect, and possessing metal tools and weapons. Doubtless these invaders, then as now, were head-hunters, and their desire for trophies, as well as for loot and slaves, caused them to wage unceasing warfare against the little blacks, whom they killed, enslaved, or drove back to the inaccessible fastnesses of the mountains, where a remnant of them is still to be found.

The newcomers did not enter the country in a single invasion, but came as wave after wave of migration. Neither did they move and settle as tribes, but formed themselves into small communities which were at war with all others.

It is probable that they at first settled only on the coasts, but later the pressure of population carried them to every part of the archipelago, where under varying conditions they developed many dialects and local customs. In the rugged mountains of north Luzon they became intense agriculturists and brought much of the land under cultivation by means of terraces. These terraces, in which they grow their rice, often extend for hundreds of feet up the steep mountain sides, while water for irrigation is carried long distances by means of flumes and ditches. In the south agriculture was less developed, but even there it furnished most of the tribes with their chief means of livelihood.

Ironworking seems to have been an ancient art with this people, who on their primitive forges turned out the excellent tools and weapons needed in their work and warfare. To-day these early invaders are represented by

such tribes as the Igorot, Ifugao, and Tinguian of northern Luzon, and the Bukidnin, Manobo, and Bagobo of Mindanao.

It is probable that prior to the fourteenth century the Chinese were carrying on considerable trade with the southern Philippines, and at about the same period the Hindu civilization of Sumatra and Java began to make itself felt in the islands of the north. It is probable that it was at this time that certain tribes secured the alphabets which were in use at the time of the Spanish Conquest.

About the year 1400 the faith of Islam swept over the whole Malayan region. Mohammedan Malays began to settle in the southern Philippines, while many of the earlier inhabitants accepted the faith of the newcomers. Soon they came into possession of firearms and from that time on became the most aggressive people in the islands. For purposes of trade they made long sea trips towards the north and south, while for loot and slaves they ravaged every part of the archipelago. To-day their descendants, known as Moro, are found chiefly in Mindanao and the islands of the Sulu group.

This was the condition at the time of the discovery of the islands by the Spaniards—the Mohammedan Moro holding the southern islands; a less advanced people of the same blood, but pagan, inhabiting the west coasts of the larger islands, in the interior of which their still less advanced kinsmen dwelt; and finally, small groups of the pygmies inhabiting the remote or inaccessible regions.

Among these tribes, which are now collectively known as Filipino, the most important numerically is the Visayan, whose members possess the central portion of the archipelago. Next in numbers is the Tagalog of central Luzon, now the most advanced group in the islands. Following them is the Ilocano, which occupies the whole western half of north Luzon. The members of this tribe are of an adventurous and aggressive disposition and are now spreading to all parts of the archipelago, particularly into the valley of the Cagayan River of Luzon. Other important tribes are the Bicol of south Luzon; the Pampanga and Pangasinan, residing north of Manila Bay; and the Cagayan of north-central Luzon. All these tribes are agricultural, but sea life, particularly fishing, takes up the time of a considerable part of the coast population.

While there are local and tribal differences between these Malayan peoples, yet there is such a general similarity that a single description can be given for all. The men average about 5 feet, and the women 4 feet, 8 inches in height; their heads are short and broad; their hair is brown black and inclined to be slightly wavy; while in color the people range from a light to a dark reddish brown. Life in the high mountains has given to the people of the interior an almost perfect physique, which is not obtained by the dwellers in the lowlands.

With Spanish rule came an increased number of emigrants from other lands, especially from China. Many of these intermarried with the natives, and from them has sprung up a powerful element known as mestizo. This class has devoted itself largely to trading and dominates the business activities of the Philippines.

History. In accordance with the Demarcation Bull of Pope Alexander VI of May 4, 1493, the Spaniards were to make discoveries and to

establish colonies beyond a meridian line in the Atlantic 100 leagues west of the Azores (later by the Treaty of Tordesillas, June 7, 1494; 370 leagues west of the Cape Verde Islands), while the Portuguese were to confine their efforts to the field of discovery east of that line. In the race for the control of the spice trade of the East Indies the Portuguese came off victorious, for they reached the Moluccas or Spice Islands the year before Balboa discovered the Pacific Ocean, revealing that the Spaniards had found, not the Indies, but a great barrier continent that blocked the way thither.

The Moluccas lay so far to the east of India as to make it probable that if the demarcation line were extended round the earth they would be found to be in the Spanish half of the globe. It was to demonstrate this hypothesis and carry to completion the great design of Columbus to find a western route to the Spice Islands that Magellan undertook his voyage around America and across the Pacific. In March, 1521, he discovered a group of islands which he named after St. Lazarus, whose festival was celebrated early in his stay among them. A few weeks later the heroic navigator lost his life in a skirmish with the natives on Maetan Island, near Cebu. That he had achieved his project and proved that the Spice Islands lay within the Spanish half of the world was accepted by King Charles of Spain, but the impossibility of accurately determining longitude in those days, the difficulties of the voyage through the Strait of Magellan and across the Pacific, and financial necessities led him to relinquish all claims to sail or trade west of a new demarcation line, in the antipodes, 297 leagues east of the Moluccas (Treaty of Saragossa, 1529). This really surrendered all rights to the newly discovered islands of St. Lazarus, which were to the west of the Moluccas. The conquest of Mexico and the establishment there of the prosperous Viceroyalty of New Spain removed the difficulties presented by the navigation of the Strait of Magellan, and, in contravention of the provisions of the treaty, an expedition was dispatched to the islands in 1542 under the command of Villalobos. This expedition had no permanent result beyond giving to the group the name of *Islas Filipinas*, in honor of the Prince, later King Philip II. The permanent conquest of the islands was achieved under Legaspi at the head of an expedition fitted out in Mexico. Legaspi arrived at Cebu in April, 1565. It was three years before his first reinforcements came and five years before the conquest of Luzon was undertaken. In June, 1571, the city of Manila was founded, and this became the seat of the Spanish power. Within the next year great progress was made, and at the time of Legaspi's death, in August, 1572, the Spanish authority was securely planted in the islands and the conversion of the natives considerably advanced. Legaspi's force was small, and the conquest was accompanied by relatively little bloodshed. The lack of social and political cohesion among the natives, the weakness of their religious beliefs, and the rivalries and hostility of the local chieftains opened the way for a patient and tactful prosecution of the policy of divide and rule; one chief after another was won over to the Spaniards, the picturesque ceremonials of the Church appealed to the artistic sense of the people, and the simple clanlike social organization was

skillfully utilized by the Spaniards as the basis of their rule. Lying on the extreme verge of the vast Empire of Spain, the islands were commonly known as the Western Islands (*Islas del Poniente*). The Portuguese protested against this invasion of their East Indian realm, but the conquest of Portugal by Spain in 1580 settled the question before there had been any serious collision. More formidable than the hostility of Portugal or the resistance of the natives were the incursions of Chinese pirates and later the attacks by the Dutch, who during their great contest with Spain made their way to the Indian seas and took possession of the Spice Islands.

The dominating impulse in this remote extension of Spanish power had been religious rather than commercial. The new conquest was to be an outpost of Christianity facing the great Asiatic heathen world. From it as a base the missionaries could prosecute their labors effectively in China and Japan. Religious purposes and interests continued to dominate the life of the islands for over three centuries. At the outset they were a great mission, like the more familiar Jesuit missions in Paraguay, and it is as a mission that the history of early Spanish rule should be studied and its results estimated. The Christian population steadily increased, and the requirements of religion, while rigorously enforced, were not more burdensome than in Europe.

In the earlier days there was little oppression and little exploitation of the people. Plantation slavery, the dark page in West Indian colonization, never existed, although household slaves were common with many of the tribes and are still held in small numbers even by Filipinos. An Act passed by the Philippine Legislature in 1913 prohibits and penalizes slavery in the regularly organized provinces.

The Christian population of the islands formed a unique community, the only large body of Asiatics permanently converted to Christianity in modern times. In its general framework the administration of the islands as a Spanish dependency was modeled on the system introduced into America, which in turn was an adaptation of that existing in the provinces of Spain. At the head was the Governor with viceregal powers, having by his side the Audiencia or Supreme Court. This body served not only as the highest court of appeal, but also as a check upon the arbitrary authority of the Governor. Another important restraint upon that official was the *residencia*, or obligation to stand ready to answer all charges of misbehavior which should be preferred during a period of six months after the termination of his tenure of office. At the outset the heads of the provincial administration were the *alcaldes mayores*, whose functions were both executive and judicial. In his judicial duties the *alcalde mayor* was assisted by an assessor and a notary. The administrative division below the province was the *pueblo*, which was ruled by the petty governor or *gobernadorcillo*, who was originally elected by the general suffrage of the married inhabitants of the *pueblo*, but in later years was chosen by a small body of 13 electors. Within the *pueblos* the population was subdivided into little clanlike groups of 40 or 50 families called *barangays*, a survival of the earlier native organization, each under a *baran-*

gay headman (*cabeza de barangay*), who was held responsible for the taxes of his group and served without pay. The *gobernadorcillo* was held responsible for all taxes due from his town. The *gobernadorcillos* and headmen of *barangays* were Filipinos; the higher administrative officers were Spaniards. The inhabitants of the *pueblos* were mostly natives. Few Spaniards lived in these mission villages except the friars. In the few Spanish towns there existed the ordinary municipal organizations that prevailed in Spanish America. There was the town corporation, *el cabildo* (chapter), consisting of two *alcaldes* (justices), eight *regidores* (aldermen), a registrar, and a constable. The members of the *cabildo* held office permanently. Membership could be bought and sold or inherited.

At the head of the ecclesiastical administration stood the Archbishop of Manila, the bishops of Cebú, Segovia, and Cáceres, and the provincials of the four great orders of friars (the Dominicans, Augustinians, Franciscans, and Recoletos) and of the Jesuits. The members of these orders (the regular clergy) greatly preponderated in numbers and influence over the secular clergy, who were mostly natives.

The economic development of the islands was at first rendered impossible by the manufacturers in Spain, who demanded protection against Asiatic competition in the markets of Mexico and Peru and secured the restriction of the imports from the Philippines to the cargo of an annual ship. Even at the close of Spanish rule the insular government remained hostile towards the development of the great natural resources of the islands and the investment of foreign capital, and under this handicap the islands never were self-supporting. For many years their principal trade was with China and was in the hands of the Chinese. Spain, drawn into the maelstrom of the Seven Years' War in the vain hope of recovering Gibraltar, lost the Floridas and saw Havana and Manila fall before English fleets. The preliminaries of peace, however, had been agreed upon before news reached England of the capture of Manila, and the conquest was therefore relinquished to Spain. The reforming government of Charles III exerted its activities even to the remote Philippines. The Royal Philippine Company was chartered to carry on direct trade between Spain and the islands (1765). Three years earlier the enterprising Governor-General Basco y Vargas, to make the colony self-supporting, introduced the government tobacco monopoly (1782), by which lands suitable for growing tobacco were arbitrarily pressed into that service and the cultivators compelled by forced labor to produce stipulated amounts to be sold to the government at fixed prices. This system of compulsory labor was practically the first attempt really to exploit the resources of the islands and during the following century was fruitful in abuses and of the seeds of revolt. It was abolished in 1882. In this connection should be mentioned the *polos y servicios*, forty days' required labor on the roads, bridges, public buildings, etc., which was exacted of the natives in addition to their tribute. The name was later changed to *prestación personal* and the period to 15 days.

The Mexican revolution severed the ancient connection of New Spain with the "Western Islands," and the Spanish constitution of 1812,

which embodied the principles of the French Revolution and which put all parts of the Spanish Empire on an equality and admitted the Philippines to representation in the Cortes, led the natives to believe that now they would be exempt from tribute and *polos y servicios*. Consequently, when the news came that Ferdinand VII in 1814 had abolished the constitution of 1812, the Ilocanos rose in rebellion. Henceforward the agitations of home politics and the example of the Spanish-American states steadily undermined the oldtime stability of conditions in the Philippines. The mission system could not be maintained in its integrity. The number of Spaniards in the islands increased, the spirit of colonial exploitation grew, the monastic orders which combined the functions of landlords and spiritual guides were more and more pervaded with the mercantile spirit. Nor did their predominant influence in the government of the islands at all diminish in an age progressively hostile to clerical control. The opening of the Suez Canal brought the Philippines relatively near to Europe and more than ever exposed them to the contending forces of modern thought. Promising young Filipinos completed their education in Europe. By a few weeks' voyage they found themselves in many respects transported from the sixteenth century to the nineteenth. That they should contentedly return to the earlier age was impossible. The Spaniards did not weather the transition. The final collapse began with the insurrection of 1896, which was primarily an agrarian revolt aimed at the expulsion of the orders from their estates and the islands.

The Liga Filipina was founded by Dr. José Rizal (q.v.) to work for the expulsion of the friars and to secure the same political concessions for the islands that had been granted to Cuba, a larger recognition of the natives in the appointments to civil offices, and freedom of the press and of association. More radical than this was the Katipunan, which was established in 1892 to secure independence by open revolt and began by wholesale assassinations of Spanish officials and friars. The existence of an elaborate plot was revealed by a native, Aug. 19, 1896, and on the 25th the mask was entirely thrown off. The garrison of Manila consisted of only 300 Spanish regulars and about 1200 native soldiers. The total number of Spanish soldiers in the islands was under 2000. The authorities could act only on the defensive until October, when reinforcements began to arrive from Spain. On the other hand, the insurrectionists were hampered by a great lack of arms and ammunition. The insurrection centred in the Province of Cavite, which was under the control of the rebels until their power was broken in the spring of 1897 by the vigorous campaign of General Lachambre. Its leaders were Andrés Bonifacio, the head of the Katipunan, and Emilio Aguinaldo (q.v.). Bonifacio was killed probably at Aguinaldo's order.

After organized resistance had been shattered it seemed wise to the Governor-General, Primo de Rivera, to attempt to secure peace by obtaining the withdrawal of the native leaders from the islands. This end was accomplished by the Treaty of Biacnabat6, under the terms of which Aguinaldo and certain other leaders were to take up their residence outside of the islands in consideration of the payment to them of

\$800,000 (Mexican). Aguinaldo and his associates claimed that they had been promised administrative and other reforms, and as they were not carried out organized a junta, or revolutionary committee, at Hongkong. It included most of the Philippine political exiles there.

The Filipino members of the junta fell to quarreling over the division of the money actually paid to them, and Isabelo Artacho ultimately attempted to institute legal proceedings against Aguinaldo, who started for Europe in order to escape them. When the United States declared war against Spain on April 21, 1898, he had just reached Singapore and had an interview with United States Consul-General Pratt with reference to coöperating with Commodore Dewey. At this time the junta definitely formulated the plan of obtaining arms from the Americans, utilizing the latter to aid in ejecting the Spaniards and then attacking them if they did not subsequently leave the islands of their own accord. The junta decided that Aguinaldo ought to go to the Philippines. He and other leaders were taken there on the United States supply ship *McCullough*, which sailed on May 17, 1898. On May 1 the Spanish fleet in the Bay of Manila had been annihilated by the United States Pacific squadron under Commodore Dewey. When Aguinaldo arrived at Cavite on May 19, he was promptly sent ashore by Commodore Dewey and speedily returned greatly discouraged, but later, having been allowed to take possession of arms and ammunition which had belonged to the Spanish garrison, succeeded in organizing a force which operated successfully against other Spanish garrisons in neighboring provinces and ultimately closely invested the city of Manila.

Manila lay at the mercy of Dewey's guns, but he could not garrison the place, and the Filipinos could not be trusted to do so. He therefore awaited the arrival of adequate land forces, after which the position of the Spanish forces was hopeless. They realized this fact, and the surrender of the city was arranged for through the Belgian Consul André. After the surrender of Manila Aguinaldo demanded Malacañan Palace for himself, and a share in the war booty for his followers, and was embittered when informed that he could not have the palace and that there would be no war booty. His troops pillaged portions of the city, which they occupied, and committed many abuses. They were ultimately compelled to retire by General Otis, whose firmness and tact averted for the time what threatened to be an armed clash between Americans and Filipinos.

Meanwhile there had been signed at Washington. On August 12, the peace protocol providing that the United States should occupy and hold the city, bay, and harbor of Manila, pending the conclusion of a treaty of peace which should determine the control, disposition, and government of the Philippines. On October 31 the cession of the whole group was demanded by the American Commissioner.

In the treaty signed Dec. 10, 1898, Spain ceded the entire archipelago to the United States, and that country agreed to pay Spain \$20,000,000, give Spanish ships and merchandise admission to the islands on the same terms accorded to American ships and goods for a period of 10 years, and transport to Spain the Spanish soldiers captured at the surrender of

Manila. The treaty was submitted to the Senate of the United States Jan. 4, 1899, and it was ratified February 8.

In the meantime, on June 12, 1898, before the signing of the protocol of peace, Aguinaldo had proclaimed the independence of the Philippines. On June 18 he promulgated a decree for the creation and administration of municipalities. On June 23 he proclaimed the establishment of a revolutionary government with himself as President. On August 6 Aguinaldo made a further attempt to secure the recognition of his government, saying that it actually ruled in nine provinces of Luzon and in Mindoro. During the following month he gradually extended his authority, while the Americans continued to hold Manila, Manila Bay, and Cavite.

The Filipinos having succeeded in securing the ejection of Spain by the Americans, as they had originally planned, perfected an elaborate plan for attacking the latter, whom they expected to drive into the sea with little difficulty. President McKinley's proclamation of Dec. 21, 1899, announcing that the islands had been ceded to the United States and that military rule was to be extended over them as rapidly as possible, added further to the growing tension, and on the night of Feb. 4, 1899, hostilities broke out at Manila, when an insurgent patrol deliberately provoked the fire of an American sentry.

The acquisition of the Philippines was opposed in the United States by persons who believed it to be the beginning of imperialism and at variance with the traditional policy of the country, as well as by others who held that the islands would impose a heavy burden on the treasury of the United States and would be a source of danger because of their exposed position. It was favored by those who believed that the United States was under moral obligation to terminate Spanish rule in the archipelago and that annexation was the only means of preventing other nations from taking possession; and by others who held that the possession of the Philippines would be of great strategic importance in view of possible future complications in eastern Asia. The discussion of the points of view and the policy of the government were hampered by great lack of knowledge of the situation. To meet in part this difficulty, President McKinley appointed, in January, 1899, the previously mentioned first Philippine Commission, consisting of President Schurman of Cornell University, Admiral Dewey, Gen. E. S. Otis, the Hon. Charles Denby, and Prof. Dean C. Worcester of the University of Michigan, to investigate conditions in the islands and to labor for the acceptance of American rule by the natives. In March, 1899, the Commission began its work. On April 5 it issued a proclamation to the people of the islands, explaining the purpose of its mission and the intentions of the American government. The efforts of the Commission were devoted particularly to conciliating prominent Filipinos and to building up a party favorable to American rule. To do this concurrently with the vigorous prosecution of the war was uphill work. In May they had a conference with some representatives of Aguinaldo, but it came to nothing.

The operations of the American army disorganized the so-called republic, and the national

movement became embodied in the leadership of Aguinaldo. During the first nine months of the war disappointingly little headway was made by the Americans. The great majority of the engagements were within a radius of 50 miles of Manila. The military authorities exercised a rigid censorship over the press dispatches, so that it was practically impossible for the general public to know the real conditions. In the fall and winter of 1899 there was greater progress. Most of the country, from Manila to Dagupan, came under American control, and the native army was driven to the mountains. The principal events in 1900 and 1901 were in connection with the process of establishing civil government in the islands, for which see above under *Government*.

On March 23, 1901, Aguinaldo was captured, and on July 4 military government was superseded by civil government in the pacified districts. On July 4, 1902, the President proclaimed the Philippine insurrection at an end everywhere except in the Moro territory, abolished the office of military governor, and transferred the authority of that official to the civil governor and the Commission. On July 30, 1907, an election for members of the Assembly was held under a law passed by the Commission on January 9 of that year. The delegates were proportioned among 35 provinces, the number varying from one to seven according to population. The Mountain Province, the Moro Province, Agusan, and Nueva Viscaya were left without representation because of the predominance of Moros or other non-Christians among their people. The first session of the Philippine Legislature opened Oct. 16, 1907. Among the more important results of American rule are the abolition of brigandage and the establishment of an excellent state of law and order throughout the islands, including the territory of the wild tribes, much of which was previously unexplored; a revolution in sanitary conditions, with almost complete riddance of the archipelago from smallpox, bubonic plague, and Asiatic cholera, and the segregation of all known lepers; the placing of the currency on a gold basis; the reformation of the judicial system; the generalization of academic instruction through the establishment of primary and secondary schools and a university; the introduction into the primary schools of industrial work; the establishment of special industrial schools, and the training of more than 8000 Filipino school teachers through the development of an effective system of normal instruction.

Important special features of the school work have been systematic physical culture which has benefited the health of the children, and the introduction of athletic contests which have aroused the spirit of sportsmanship and have tended to diminish interest in cockfighting and gambling.

The checking of the spread of rinderpest among the draft animals has saved the island from complete industrial ruin. The construction of thousands of miles of improved roads, and of cart and horse trails and numerous fine bridges; has brought hundreds of thousands of small farmers within reach of the world's markets, and in combination with the establishment of an admirable state of public order and the judicious stimulation of agriculture has quadrupled the exports of the islands in a dec-

ade and a half of American rule. Their importance has increased in like proportion during the same period. An important factor in this result was the passage of the Payne Tariff Bill and of subsequent measures which opened to the Philippines the markets of the United States.

The establishment of freedom of speech and of the press and the protection and uplifting of many of the more backward tribes are milestones on the march of the Philippine peoples towards a higher civilization.

Bibliography. General: J. Mallat, *Les Iles Philippines considérées au point de vue de l'hydrographie et de la linguistique* (Paris, 1846); Sir John Bowring, *A Visit to the Philippine Islands* (London, 1859); Fedor Jagor, *Travels in the Philippine Islands* (Eng. trans., ib., 1875); Joaquín Martínez de Zúñiga, *Estadismo de las islas Filipinas*, edited by W. E. Retana (2 vols., Madrid, 1893); Albert Sonnichsen, *Ten Months a Captive among Filipinos* (New York, 1901); A. J. Brown, *The New Era in the Philippines* (4th ed., ib., 1903); F. W. Atkinson, *Philippine Islands* (Boston, 1905); C. H. A. Forbes-Lindsay, *America's Insular Possessions* (2 vols., Philadelphia, 1906); id., *Philippines under Spanish and American Rules* (ib., 1906); W. B. Freer, *Philippine Experiences of an American Teacher* (New York, 1906); Berthold Laufer, "Relations of the Chinese to the Philippine Islands," in *Smithsonian Institution, Miscellaneous Collections*, vol. 1 (Washington, 1908); H. M. Wright, *Handbook of the Philippines* (Chicago, 1907); D. C. Worcester, *The Philippine Islands and their People* (New York, 1909); Fritz von Hochberg, *An Eastern Voyage* (2 vols., ib., 1910); W. H. Taft, *The Philippine Islands*, an address (ib., 1904). Antiquities: J. M. Miller, *Philippine Folklore Stories* (Boston, 1904); W. A. Reed, *Negritos of Zambales* (Manila, 1904); A. E. Jenks, *The Bontoc Igorot* (ib., 1905); Venturillo, "Manners and Customs of the Tagbanua," in *Smithsonian Institution, Miscellaneous Collections*, vol. xlviii (Washington, 1907); E. B. Christie, *The Subanuns of Sindangan Bay* (Manila, 1909); C. D. Willcox, *Head-Hunters of Northern Luzon* (Kansas City, Mo., 1912); F. C. Cole, "Chinese Pottery in the Philippines," "Wild Tribes of the Davao Gulf," and "Traditions of the Tinguian: A Study in Philippine Folk-Lore," in *Field Museum of Natural History, Publications*, Nos. 162, 170, 180 (Chicago, 1912-15); Finley and Churchill, *The Subanu*, published by the Carnegie Institution (Washington, 1913); also publications of the Ethnological Survey of the Department of the Interior (Washington). History: Thomas de Comyn, *Memoria sobre el estado de Filipinas* (Madrid, 1820; Eng. trans. by W. Walton, London, 1821); Juan González de Mendoza, *The History of the Great and Mighty Kingdom of China*, part ii, edited by Sir G. T. Staunton for the Hakluyt Society (2 vols., ib., 1853-54); Antonio de Morga, *History of the Philippines from 1521 to the Beginning of the Seventeenth Century*, translated by H. E. J. Stanley for the Hakluyt Society (ib., 1868; also trans. and ed. by Blair and Robertson, 2 vols., Cleveland, 1907); Blair and Robertson (eds.), *Philippine Islands, 1493-1898* (55 vols., Cleveland, 1903-09); A. R. Colquhoun, *Mastery of the Pacific* (new ed., New York, 1904); John Foreman, *The Philippine Islands* (ib., 1906); E. G. Bourne,

Discovery, Conquest, and Early History of the Philippine Islands (Cleveland, 1907); Browne and Dole, *New America and the Far East* (9 vols., Boston, 1910); E. C. Chamberlin, *The Philippine Problem, 1898-1913* (ib., 1913); Frederick Funston, *Memories of Two Wars* (New York, 1914); J. A. Le Roy, *Americans in the Philippines* (2 vols., Boston, 1914); D. C. Worcester, *The Philippines, Past and Present* (2 vols., New York, 1914); D. P. Barrows, *History of the Philippines* (Chicago, 1915); also *Report of the United States Philippine Commission* (5 vols., Washington, 1901); *Reports of the Second (or Permanent) United States Philippine Commission* (ib., 1901 et seq.); *United States Census of the Philippine Islands, 1903* (4 vols., ib., 1906). Government, etc.: C. F. Randolph, *Law and Policy of Annexation* (New York, 1901); W. F. Willoughby, *Territories and Dependencies* (ib., 1905); H. P. Willis, *Our Philippine Problem* (ib., 1905); J. A. Le Roy, *Philippine Life in Town and Country* (ib., 1905); N. M. Saleeby, *Studies in Moro Law and Religion* (Manila, 1906); *American Colonial Policy and Administration*, published by the American Academy of Political and Social Science (Philadelphia, 1907); J. H. Blount, *American Occupation of the Philippines, 1898-1912* (New York, 1912); Miller and Storms, *Economic Conditions in the Philippines* (Boston, 1913); D. P. Barrows, *A Decade of American Government in the Philippines, 1903-1913* (Chicago, 1914); Charles Crow, *America and the Philippines* (New York, 1914). Bibliography, etc.: W. E. Retana y Gamboa, *El periodismo filipino: Noticias para su historia, 1811-1894* (Madrid, 1895); A. P. C. Griffin (comp.), *List of Books on the Philippine Islands in the Library of Congress* (Washington, 1903); T. H. Pardo de Tavera (comp.), *Biblioteca filipina* (ib., 1903); J. A. Robertson (comp.), *Bibliography of the Philippine Islands* (Cleveland, 1908); M. M. Norton, *Builders of a Nation: A Series of Biographical Sketches* (Manila, 1914); also *The Official Gazette* (ib., 1902 et seq.), *Philippine Journal of Science* (ib., 1906), and publications of the United States Bureau of Insular Affairs (Washington).

PHILIPPINE LANGUAGES. Many dialects are spoken by the inhabitants of the Philippine Archipelago. On the smaller islands and along the coasts of the larger more than a score of dialects have been recorded, while to these must be added an equally large number of idioms spoken by the pagan tribes of the interior. All these dialects, however, may be considered as subdivisions of Malay, which itself is a member of the Malayo-Polynesian family.

Several references to the language spoken by the aboriginal pygmy blacks, found in the writings of early travelers in the islands, seem to indicate that this differed radically from the Malay, in that it was of monosyllabic structure. While it seems probable that the pygmies did originally have a distinct language, there is at present no evidence of that fact, and to-day all the known groups of Negrito speak the language of their more advanced neighbors.

Several factors must be taken into consideration when attempting to account for the many dialects spoken by the Filipino. In the first place they represent several waves of migration rather than one wave. The newcomers settled in districts separated from one another by stretches of water, mountains, or other natural

barriers, and these hindrances to easy communication were, in time, sufficient to bring about linguistic differences. Still more potent was the fact that most of these invaders were head-hunters, and the hostile raids of one tribe against another made intercommunication impossible. The Tinguian tribe of northern Luzon affords a striking example of the influence of head-hunting on a language. The people of this group are of a physical type so uniform, and are so similar in culture and religious beliefs, it is safe to assume that they formed a single division until comparatively recent times; but the custom of head-hunting has divided them into five hostile groups, the members of which speak dialects not mutually intelligible.

The conversion to Mohammedanism of the people of the Sulu Archipelago and the Christianizing of the coast people of the middle and northern islands were factors of great importance in the development of Philippine tongues. Many Arabic and Spanish words entered the languages: Arabic script came into use in the south, and the Roman letters of the Spanish became the medium of written thought in the north. Even the structure of the language was modified in some instances through the efforts of Spanish and Mohammedan missionaries.

The influence of Chinese trade, which has been carried on for several centuries, is found in the vocabularies of nearly all the tribes, and the effect of the American occupation of the islands has been by no means inconsiderable.

An outside influence still earlier than any yet mentioned was that of India. Words of Sanskrit origin are found in every dialect, while the native script, found in use by the Spanish and still employed by two of the pagan tribes, seems to have been of Indian origin. One of these scripts still in use is that of the Tagbanana, of Palawan Island. In it only four characters corresponding to vowels are found: these are *a*, *o*, *ua*, *edi*. Fourteen other characters appear, but, as in the Indian alphabets, there is no way of expressing a consonant without a vowel. Hence every consonanted character represents that consonant plus the vowel *a*, unless secondary marks are added to indicate other vowel sounds.

Despite apparent dissimilarities the Philippine dialects possess so much in common it is evident that all are variants of one tongue. The following are some of the fundamental traits found in nearly all the dialects:

Each is, for the most part, built up of dissyllabic roots and monosyllabic particles. These roots, when standing alone, usually express nominal ideas, and grammatical relations are indicated by prefixing, infixing, or suffixing the particles. There is no grammatical verb.

Some of the particles express pronominal and adverbial ideas, while others are utilized only in the formation of verbs. Those used with the verb fall into two broad divisions—those with active, and those with more or less of a passive, signification. All in the first division, except the inchoative, which is sometimes used as an infix, usually appear as prefixes to the root, to which is suffixed the nominal form of the pronoun subject, followed by the oblique form of the object of the action. In this construction are found the particles indicating simple actions, particular or specific agency, causation, ability, community of action, and the inchoative.

In the second division is usually found a

suffix indicating a true passive, and in addition to this are prefixes, suffixes, and infixes which in meaning correspond to the active particles, yet seem to give to the verb a passive force. With all these forms the subject of the action is found in the following genitive, while the object, if expressed, is in the oblique case. Certain writers have with some reason called these possessive verbs. Verbs of this type are regularly used, unless it is desired to place special emphasis on the agent. Here are found the verbals expressing instrument, person, or place affected, person commanded, and the infinitive.

Considerable variation exists between the groups in the manner of expressing mode and tense, but most commonly a change in the initial letter of a prefixed particle accomplishes this result, as, e.g., in Ilocano *Mangsurat* indicates one who writes and *Nangaurat* one who wrote.

Existence and nonexistence are not expressed in the manner just described. For this purpose quasi verbs, without inflection, appear. Possession is shown by the noun with such a form with its possessive pronoun suffix.

The only inflections occurring in Philippine languages are found in the definite article and in the personal and demonstrative pronouns. In these three cases are distinguished a nominative and genitive which express ideas equivalent to those in English; in addition, the genitive designates agent and instrument. The third or oblique case corresponds closely to the dative and ablative of Latin and generally takes the place of the prepositions used in English.

Most of the dialects possess two forms for the nominative of the personal pronouns. The first is an independent emphatic form, while the nonemphatic appears as a suffix. A dual is found, and two forms for the first person plural—the first of which excludes the person addressed, while the second includes all persons present.

Inflection is secured for the verb by adding the suffixed forms of the personal pronouns. In negations these pronominal forms are always suffixed to the negatives. The suffixed forms of the genitive case regularly take the place of possessive pronouns.

Gender is expressed by the word for male or female, which follows its noun like a modifier. There is no method by which this distinction can be made in noun, pronoun, or verb.

The declined definite article shows the case, and usually the number, of the substantive before which it stands. However, a noun or an adjective may appear in its plural form if the idea of plurality is to be emphasized.

The use of ligatures is very extensive. They appear as connectives between words, phrases, and sentences, one of which modifies the other. Their use is also obligatory between an adjective or a substantive qualified and its noun, but with a demonstrative their use is irregular. The attributive ligature is usually the definite article, while quite a different form appears for the appositional.

All dialects possess a full series of vowel sounds, between which there is frequent interchange, even in the same dialect. Thus, *o* and *u* are continually confused, both in oral speech and in writing, while there is frequently a similar confusion between *e* and *i*. An indefinite vowel *e*, such as obscure *e* in *sure* or *ur* in *burrow*, is of common occurrence, either replacing *o*, *u*, or *a* or used independently.

The consonants, most of which are pronounced as in English, include labials, dentals, palatals, and the glottal catch or hiatus. In the palatal series is found a postpalatal nasal, written *ng* or *n*. The articulation is not clear, and the stop is not present, but the back of the tongue is well up on the soft palate.

One of the chief differences between the dialects is the interchange of consonants in words of like origin. Among the most common of these are the change of *r*, *d*, and *w* into *l*, *d* into *dj*, *k* into *g*, final *k* into a glottal catch; *f* and *v* occur in only a few dialects, in which they regularly replace *p*, *b*, or *u*.

There is about an equal division between vowels and consonants in the various dialects, and since consonantic clusters are rare the language is soft and musical.

An intervocalic consonant always goes with the next vowel, or if two consonants occur between vowels they are divided and one goes with each vowel. This makes possible the rule that there are as many syllables as there are vowels or diphthongs. In words of two or more syllables accent usually falls on the penultima, but in polysyllabic words a secondary accent is placed on the ultima.

The principal dialects now in use and their locations are: *Ilocano*, northwestern Luzon; *Pangasinan*, middle-western Luzon; *Pampango*, central Luzon; *Tagalog*, Manila, middle Luzon, and coasts of Mindoro; *Bikol*, southern Luzon, *Visaya*, Visayan Islands and the northern and eastern coasts of Mindanao; *Sulu*, Sulu Archipelago and northwestern Mindanao; *Maguindanao*, southwestern Mindanao.

Bibliography. Diego Bergaño, *Arte de la lengua Pampanga* (2d ed., Sampaloc, 1736); Bugarín, *Diccionario Ibanag-Español* (Manila, 1854); De Cuevas, *Arte nueva de la lengua Ibanag* (2d ed., ib., 1854); J. J. de Noceda, *Vocabulario de la lengua Tagala* (2d ed., ib., 1860); Diego Bergaño, *Vocabulario de la lengua Pampanga en romance* (2d ed., ib., 1860); Mariano Pellicer, *Arte de la lengua Pangasinana* (2d ed., ib., 1862); Sebastian de Totanes, *Arte de la lengua Tagala* (2d ed., Binondo, 1865); Cosgaya, *Diccionario Pangasinán-Español* (Manila, 1865); Figueroa, *Arte del idioma Visaya de Sámar y Leite* (2d ed., Binondo, 1872); Raimundo Lozano, *Cursos de la lengua Panayana* (Manila, 1876); Andrés de San Agustín, *Arte de la lengua Bikol* (ib., 1879); Ramón Zueco de San Joaquín, *Método del Dr. Ollendorff para aprender . . . un idioma cualquiera adoptado al bisaya* (ib., 1884); J. F. de La Encarnación, *Diccionario Bisaya-Español* (3d ed., 2 vols., ib., 1885); Agustín, *Vocabulario Iloco-Español* (2d ed., ib., 1888); Naves, *Gramática Hispano-Ilocana* (2d ed., Tambobong, 1892); Jacinto Juanmartí, *Gramática de la lengua de Maguindanao* (Manila, 1892); id., *Diccionario Moro-Maguindanao-Español* (ib., 1892); Cowie, *English-Sulu-Malay Vocabulary* (London, 1893); Alonso de Métrida, *Arte de la lengua Bisaya-Hiligayna* (Tambobong, 1894); Julián Bermejo, *Arte compendiado de la lengua Cebuana* (2d ed., ib., 1894); Campomanes, *Lecciones de gramática Hispano-Tagala* (5th ed., Manila, 1894); O. Scheerer, *The Nabolai Dialect* (ib., 1904); Williams, *Manual and Dictionary of Ilocano* (ib., 1907); Blake, "Contributions to a Comparative Philippine Grammar," in *American Oriental Society, Journal*, vols. xxvii, xxviii (Boston, 1907-08); O. Scheerer, *The Batan Dia-*

lect (Manila, 1908); C. W. Seidenadel, *First Grammar of the Language Spoken by the Bontoc Igorot* (Chicago, 1909); C. E. Conant, *The Pepet Law in Philippine Languages* (ib., 1913).

PHILIPPINES, UNIVERSITY OF THE. An institution for higher education established by act of the first Philippine Legislature in 1908. It took over the already existing Philippine Medical School, which had been established in 1905 and opened in 1907. Different schools and colleges have been added since 1908, and the university now consists of a College of Liberal Arts, a College of Medicine, a College of Engineering, a College of Law, the School of Pharmacy as part of the College of Medicine, a College of Veterinary Science, the School of Education as part of the College of Liberal Arts, and a School of Fine Arts. All these departments are located at Manila. The College of Agriculture is located at Los Baros, Laguna Province. The College of Liberal Arts grants the bachelor's degree after two years and the master's degree after three additional years of study; the courses in other fields vary from three to five years in length. The government of the university is in the hands of a board of regents, six holding office ex officio and five appointed by the Governor-General. The enrollment in the university, excluding the School of Fine Arts, was 704 in 1912-13. The president in 1915 was the Rev. Murray Bartlett, D.D.

PHILIPPONS. A Russian sect, a branch of the Raskolniki (q.v.), who emigrated to Lithuania and East Prussia at the beginning of the eighteenth century. They take their name from their leader, Philip Pustosviit. They are described as peaceable and orderly, skilled in agriculture, thrifty, and industrious. They refuse to take oaths or perform military service, and set a high value upon suffering and death for conscience' sake. Priestly duties, such as leading in worship, baptism, and absolution, are performed by the oldest of the community. They do not observe the Lord's Supper and have no confirmation or religious marriage ceremony. Their religious services consist in singing psalms and reading the Gospels.

PHILIPPOLIS (Bulg. *Plovdiv*, Turk. *Pilibe*) The largest city of Bulgaria next to Sofia, and formerly the capital of eastern Rumelia. It is situated in a wide, fertile plain at the head of navigation on the Maritza River, on the railway between Constantinople and Sofia, 80 miles southeast of the latter city (Map: Balkan Peninsula, E 3). Most of the houses are of wood, but the city has been much enlarged and beautified by the laying out of new streets and public parks, such as the beautiful Exhibition Park, laid out in 1892, and the growing up of fine residential suburbs containing the villas of wealthy Greeks and Bulgarians. The city is the seat of an Orthodox archbishop and has a new Orthodox cathedral, besides a number of other Christian churches and many mosques. There are also a college and a national library. Philippopolis is the chief commercial centre of central Bulgaria, and has an active trade in the products of its manufactures, such as silk and cotton fabrics and attar of roses, as well as in rice, grain, tobacco, and hides. Pop., 1910, 47,981, of whom the majority are Bulgarians, the remainder being mostly Turks and Greeks. Philippopolis was an important Thracian city in ancient times. It was almost wholly destroyed by an earthquake in 1818, and again by fire in

1846; but it recovered rapidly, owing to its excellent trade facilities.

PHILIPPOTEAUX, fêl'pô'tô', Félix (1815-84). A French painter of battle scenes. He was born in Paris and was a pupil of Léon Cogniet. His thorough knowledge of military details enabled him to depict the turmoil of battle with great historical truth but somewhat dryly, as may be judged by "Louis XV Inspecting the Battlefield of Fontenoy" (1840, formerly in the Luxembourg Museum) and the "Battle of Rivoli" (1844, Versailles Museum). His "Last Banquet of the Girondists" (1850, Marseilles Museum) is also worthy of notice. He is well known as a painter of panoramas, which he improved greatly. (See PANORAMA.) He received the cross of the Legion of Honor in 1846.

PHILIPPSBURG, fêl'p's-burk. A town in the Grand Duchy of Baden, situated near the Rhine, 17 miles north of Karlsruhe. It manufactures cigars; in the vicinity are tobacco and hop plantations. It was once a noted fortress, founded by Philip Christopher von Sötern, Bishop of Speyer, in 1618. It played a conspicuous part in the wars of the seventeenth century, and the fortifications were destroyed in 1809. Pop., 2600.

PHILIPPSON, fêl'p-zôn, MARTIN (1846-). A German historian, born at Magdeburg. He studied at Bonn and Berlin, became docent at Bonn in 1871, and in 1878 professor in the University of Brussels. From this post he resigned in 1890 after a sharp quarrel with the anti-German student body, and returned to Berlin. Philippson wrote: *Geschichte Heinrichs des Löwen* (1868); *Heinrich IV. und Philipp III.* (1871-76); *Geschichte des preussischen Staatswesens vom Tode Friedrichs des Grossen bis zu den Freiheitskriegen* (1880-82); *Histoire du règne de Marie Stuart* (3 vols., 1891-92); *Kurfürst Friedrich Wilhelm von Brandenburg* (1879-1901); *Kulturgeschichte Europas seit dem Ausgange des Mittelalters* (1898); *Das Leben Kaiser Friedrichs III.* (1900; 2d ed., 1906); *Der Grosse Kurfürst* (1897-1903); *Geschichte des jüdischen Volkes in der neuesten Zeit* (3 vols., 1911). He founded also the *Allgemeine Zeitung des Judentums*.

PHILIPPOS SIDETUS. An Asiatic Church father who wrote about 150 A.D. Only a few fragments of his works have been preserved. See DE BOOR FRAGMENT.

PHILLIPS, AMBROSE (1875-1749). An English poet, born in Shropshire, probably in 1875. He was graduated from St. John's College, Cambridge (B.A., 1896; M.A., 1700), and was elected fellow of his college, but resigned his fellowship (1708) and traveled on the Continent. From Copenhagen he addressed (March 9, 1709) an *Epistle to the Earl of Dorset*, which was published in the *Tatler* (No. 12) with warm praise by Steele. The same year appeared his pastorals in Tonson's *Miscellany*, along with Pope's *Pastorals*. Then ensued a controversy as to which poet had better succeeded. Both series are artificial. Phillips was angered by a mock commendation of his pastorals which Pope contributed to the *Guardian* (No. 40), and he is said to have hung up a rod at Button's coffee house for chastising his adversary, but no encounter ever took place. Phillips was, however, remembered in the *Dunciad*. In ridicule of Phillips, Gay wrote the *Shepherd's Week* (1714), descriptive of rustic life with the gilt off. In 1712 Phillips was lauded for his adaptation of Racine's *An-*

dromaque. In 1718-19 he edited an imitation of the *Spectator* called the *Freethinker*. His support of the government led to his appointment as secretary to Bishop Boulter in Ireland (1724). He also represented Armagh in the Irish Parliament; was made secretary to the Lord Chancellor (1726) and judge of the Prerogative Court (1733). He died in London, June 18, 1749. Phillips also translated the odes of Sappho (1713), once thought to be a brilliant achievement. Perhaps his best work is represented by several short poems to children (1725-26). Consult Alexander Pope, *Works*, edited by Elwin and Courthope (10 vols., London, 1871-89), and Samuel Johnson, *Lives of the British Poets*, vol. iii, edited by G. B. Hill (ib., 1905).

PHILLIPS, FRANCIS CHARLES (1849-). An English novelist and playwright. He was born at Brighton, was educated at Brighton College and at Sandhurst, but after entering the army decided to follow the law and in 1884 was called to the bar. About this time he began, without abandoning his practice, to write both plays and novels. Of the latter the most noted, *As in a Looking Glass* (1885), was adapted for the stage and was played by Mrs. Bernard Beere in London and by Sarah Bernhardt in Paris. Another novel, *The Dean and his Daughter*, was dramatized very successfully by Phillips and Sydney Grundy as *The Dean's Daughter* (1888). Phillips wrote in all about 30 novels and, in collaboration with Charles Brookfield, Leonard Merrick, and Walter Parke, various plays besides those named.

PHILLIPS, or **PHILLIPS**, JOHN (1676-1709). An English poet, born at Bampton, Oxfordshire, Dec. 30, 1676, and educated at Winchester School and at Christ Church, Oxford. He died at Hereford, Feb. 15, 1709. Phillips is still known for two poems—the *Splendid Shilling*, a mock-heroic poem in Miltonic blank verse (1701), and *Cyder* (1708), on the plan of Vergil's *Georgics*. The first was translated into Latin and the second into Italian. As a Tory reply to Addison's *Campaign* Phillips wrote *Blenheim* (1705). Phillips was among the few poets between Milton and Thomson to cultivate blank verse. The 1715 edition of Phillips's *Poems*, a collective edition, contains a *Life* by George Sewall. Consult Samuel Johnson, *Lives of the British Poets*, edited by G. B. Hill (London, 1905).

PHILLIPS, KATHARINE (1631-64). An English poet, better known by her literary nickname, "the matchless Orinda." She was born in London, the daughter of John Fowler, a well-to-do merchant. In 1647 she married a Welshman, Hector Phillips, son of her mother's second husband; four years later she addressed Henry Vaughan in what seems her first poem, and she soon formed that literary and friendly circle which included Jeremy Taylor and Sir Charles Cotterel and in which she took the name Orinda. She spent the year 1662 in Dublin and there made many friends among the Royalist party, with which she had sentimentally allied herself, and translated Corneille's *Pompée* with great success. *Horace* she did not live to complete, for she died of smallpox in her thirty-third year. Her poems were highly praised by her contemporaries. Her *Letters to Poliarchus* (Sir Charles Cotterel) were published in 1705. An edition was published in 1905. Consult Edmund Gosse, *Seventeenth Century Studies* (new ed., New York, 1914).

PHILIPSBURG. A borough in Center Co., Pa., 39 miles by rail north by east of Altoona, on the Mushannon Creek and on the New York Central and Hudson River, the Pennsylvania, and the Pittsburgh and Susquehanna railroads (Map: Pennsylvania, E 5). It is situated in the Clearfield coal region and has extensive mines of bituminous coal. Deposits of clay also are found in the vicinity, and there are foundries and machine shops, flouring and planing mills, and manufactories of shovels, cigars, bricks, tools, etc. It is the seat of Cottage State Hospital and has Trinity Protestant Episcopal Church, erected in 1828, and two sanitariums. Pop., 1900, 3266; 1910, 3585.

PHILIP THE BOLD (1342-1404). Duke of Burgundy from 1363 to 1404. He was the third son of John the Good, King of France. He was present in 1356 at the battle of Poitiers (q.v.), and displayed such courage, venturing his own life to save that of his father, that he became known as *le Hardi* (the Bold). He shared his father's captivity in England, and on returning to France in 1360 received in reward of his bravery the Duchy of Touraine, and subsequently (1363) also that of Burgundy, being created at the same time the first peer of France. In 1369 he married Margaret, the daughter and heiress of Count Louis de Maële of Flanders. On the death of King Charles V, in 1380, he became Regent, together with his brothers, for his nephew, Charles VI. In 1382, at the head of a French army, he marched against Philip van Artevelde, the leader of the Flemish burghers in their revolt against their count, and overwhelmed him in the battle of Roosebeke. Flanders and Artois fell to him by the death of Louis in 1384. Energy and wisdom characterized his government; arts, manufactures, and commerce were encouraged, and his land was one of the best governed in Europe. When Charles VI became insane (1392) the supreme control of affairs in France fell into the hands of Philip, and he used his power to strengthen his own line. He died at the château of Hal in Hainault, April 27, 1404. Consult Ernest Lavisse, *Histoire de France*, vol. iv, part i (Paris, 1902). See also **BURGUNDY**; **FLANDERS**; **FRANCE**.

PHILIP THE GOOD (1396-1467). Duke of Burgundy from 1410 to 1467. He was the son of John the Fearless and Margaret of Bavaria. He was born at Dijon, June 13, 1396, and on the assassination of his father, on the bridge of Montereau, he succeeded to the Duchy of Burgundy. Bent on avenging the murder of his father, he entered into an offensive and defensive alliance with Henry V of England, recognizing him as the rightful Regent of France and heir to the throne after Charles VI's death. This agreement was sanctioned by the imbecile King himself as well as by the mother of the Dauphin, Queen Isabella, in the Treaty of Troyes (1420). The Dauphin (later Charles VII), however, declined to resign his rights, and took to arms, but was defeated and driven beyond the Loire. Some disputes with the English concerning possessions in Brabant and elsewhere prompted Philip to threaten in 1429 to conclude a treaty with Charles VII. However, the English, by ceding to Philip the Province of Champagne and paying him a large sum of money, restored him to their side. In 1430 Holland, Hennegau, and Brabant were annexed to Burgundy. Though much more powerful

than his nominal superior, the King of France, Philip did not take the royal title. After the death of his wife, sister of the English Regent in France, the Duke of Bedford, he gradually drew nearer to Charles VII, and in 1435 tried to negotiate a peace at Arras between all parties in the Hundred Years' War. The English demands proving excessive, he made peace alone with the French King. The latter part of his reign was filled with trouble caused by the quarrels between Charles VII and his son, the Dauphin Louis, afterward Louis XI (q.v.), who had fled from his father's court and sought shelter with Philip. Philip died at Bruges, June 15, 1467, deeply lamented by his subjects. Under him Burgundy was the most wealthy, prosperous, and tranquil state in Europe; its ruler was the most feared and admired sovereign of his time, and his court far surpassed in brilliancy those of his contemporaries. He favored music, painting, and the arts in general, and knights and nobles from all parts of Europe flocked to his jousts and tournaments. In January, 1429/1430, in honor of his marriage with Isabella of Portugal, his third wife, he established the famous order of the Golden Fleece (q.v.). Consult: A. G. de Baranté, *Histoire des ducs de Bourgogne*, vols. iii-vi (2d ed., Brussels, 1834-40); Henri Pirenne, *Histoire de Belgique*, vol. ii (ib., 1902); *Cambridge Modern History*, vol. i (New York, 1902). See **CHARLES VII**.

PHILIP THE MAGNANIMOUS (1504-67). Landgrave of Hesse from 1509 to 1567. He was born on Nov. 13, 1504, and succeeded to the throne on the death of his father, William II, in 1509. In 1518 he was declared of age. At first he showed no sympathy for the Lutheran doctrines, of which he was to become the champion, and in 1523 he married the daughter of the Catholic Duke George of Saxony. In 1525, however, he was definitely won over to the cause of the Reformation. At the same time he aided in suppressing the Peasants' War. Philip became one of the chief leaders of the Reformation in Germany, and together with the Elector John of Saxony formed in 1526 the Protestant League of Gotha and Torgau. In 1529 he arranged the celebrated disputation between Luther and Zwingli at Marburg. It lasted for three days (October 1-3), but the two parties were unable to agree on the doctrine of the Eucharist. Philip himself, however, began to lean strongly towards the Swiss side. In 1531 he formed, together with the Elector of Saxony and other Protestant princes, the League of Schmalkald (q.v.). On March 4, 1540, Philip married a second time, though his first wife was still living. Luther and Melancthon had consented to his bigamy, and the revelation of this fact caused a great scandal. In the Schmalkald War, which broke out in 1546, Philip did his best for the Protestant cause, but the treachery of Maurice of Saxony, his son-in-law, who joined Charles V, made matters hopeless. At the battle of Mühlberg on April 24, 1547, Philip was made prisoner and placed in close confinement. He was liberated in 1552 by the action of Maurice, who deserted Charles and rejoined the Protestant cause. Philip died March 31, 1567, leaving four sons, among whom Hesse was divided. Consult Rommel, *Philipp der Grossmütige, Landgraf von Hessen* (Giessen, 1880); and Leopold von Ranke, *History of the Reformation in Germany*, translated by S. Austin (New York, 1905).

PHILIP THE MAGNANIMOUS, ORDER OF. A Hessian order of merit with five classes, founded by Grand Duke Ludwig II in 1840. The decoration is an eight-pointed cross of white enamel, with the motto *Si Deus nobiscum, quis contra nos*.

PHILISTINES, *fil-is'tinz* or *fil'is-tinz*; *Brit.*, usually, *fil'is-tinz* or *tinz* (Lat. *Philistini*, Heb. *Pelishtim*, Assy. *Palastu*, *Pilishtu*, Egypt. *Plst*). The name of a people who lived on the coast of the Mediterranean Sea, southwest of Judaea. According to Amos ix. 7 they were immigrants from Caphtor, and in Jer. xvii. 4 they are said to be "the remnant of the isle of Caphtor." Caphtor corresponds to the Egyptian Kptar, which is now generally identified with Crete. Concerning their life on Crete nothing is known with certainty. In view of the fact, however, that various systems of writing were in vogue on the island, it is highly probable that the Philistines brought with them a script which may have exercised an influence upon the formation of the North and South Semitic alphabets. (See ALPHABET.) The typical Philistine name Akaush (Ikausu, Achish) seems to have been in use among the Kaffo people before the Philistine invasion of Syria. The permanent settlement of this people in Canaan apparently took place in the reign of Ramses III (c.1200-1169 B.C.). At any rate, they are not mentioned before his time among the peoples of the sea in Egyptian inscriptions. The "land of the Philistines" is referred to in Gen. xxi. 32, 34, but in the body of the narrative Abimelech is called only "King of Gerar," so that the later designation of the country may be suspected of being an addition to the text. The Song of Moses, in which "the inhabitants of Philistia" are mentioned (Ex xv. 14), is generally held by scholars to be comparatively late, and the same applies to the allusion in Ex. xiii. 17 to "the way of the Philistines." Some of the cities which the Philistines afterward occupied meet us in Egyptian inscriptions of an earlier age and in the Tell el Amarna tablets, but their names are Semitic, and they were probably founded by the Avvites. (See CANAANITES.) The story of Shamgar ben Anath, who smote 600 Philistines with an ox goad, is scarcely sufficient as evidence of the presence of this people in Canaan before the battle on the Kishon; the Song of Deborah, which mentions Shamgar, says nothing concerning the Philistines. (See JEWS.) The blessing of Japheth by Noah (Gen ix. 27) seems to reveal a friendly feeling on the part of the Hebrews to the Cretan invaders of Palestine as still possible in the middle of the twelfth century (see JAPHETH), while the story of Samson is likely to reflect the attitude at a later time, when intermarriages were still common but racial hatred and border strife had begun to assert themselves. According to the Papyrus Golénischeff, the Thekel, companions of the Philistines in the raids of the time of Ramses III, were settled at Dor in the days of Ramses XII, where they were found by Wen Amon (c.1120 B.C.). In the following century the Philistines established themselves throughout the land which has been named Palestine after them. The battle of Aphek was a crushing defeat for Israel; their sacred palladium (see ARK OF THE COVENANT) was captured, and Philistine garrisons were placed in the conquered cities, including Beth Shean. The war of emancipation was begun by Saul and Jonathan, but they both

fell in the battle on Mount Gilboa (c.1023). David, who had taken part in the struggle for freedom, but had been forced to become the vassal of Achish (q.v.) of Gath, made himself King of the Negeb, a part of which was occupied by the Cherethites, or Cretans, Judah, and finally Israel, and confined the Philistines to the pentapolis composed of Gaza, Ashkelon, Ashdod, Ekron, and Gath. He had a bodyguard made up of Cherethites and Pelethites (q.v.), i.e., of Eteo-Cretans and Philistines. It is probable that Egypt participated in the reduction of Philistine power, as Gezer was captured by the Egyptian King (1 Kings ix. 16 b) and given to Solomon, and no Philistine city is included among the conquered towns in Shoshenq's list. The confederacy seems to have been broken up by this Egyptian conquest, and thenceforth each city appears to have pursued its own policy. According to 2 Chron. xi. 8 Rehoboam held possession of Gath. Nadab and Elah of Israel besieged Gibbethon (1 Kings xv. 27; xvi. 15). Hazael, King of Damascus, took Gath (2 Kings xii. 17), and Uzziah broke down the walls of Gath, Jabneh, and Ashdod (2 Chron. xxvi. 6). Ahaz suffered serious defeats at the hands of the Philistines. Hezekiah raided their country as far as Gaza. Mitinti of Ashkelon and Khanun of Gaza were vassals of Tiglath-pileser IV and took part in the revolt of 734-732. Khanun fled to Egypt, but returned and was defeated by Sargon II at Raphia (720 B.C.) Sargon deposed Azuri of Ashdod and set his brother Akhimiti on the throne. The latter was expelled by the party opposed to Assyria, who made Yawani king. Ashdod and Gath were captured by the Assyrians in 711 and many of the inhabitants deported. Zidka of Ashkelon, who ruled also over Joppa and other towns, took part in the revolt against Sennacherib in 701. He was carried to Assyria and Sharruludari was put into his place. Padi of Ekron, who was loyal to Assyria, had been sent by the war party as a prisoner to Hezekiah, the King of Judah was forced to deliver him up, and he was restored to his throne. Mitinti of Ashdod, Padi of Ekron, and Zilbel of Gaza are mentioned as Assyrian vassals by Esarhaddon and Asurbanipal. Psameticus I besieged Ashdod 29 years, probably 648-619 B.C.; and in 625 Ashkelon was taken by the Scythians and the temple of Aphrodite Urania, or Derketo, was spoiled. (Herodotus, i. 105.) Necho II took Gaza (c.608 B.C.), but was defeated on the Euphrates in 605 and lost Syria to Nebuchadnezzar. Gaza alone opposed Cambyses on his way to Egypt in 525. Herodotus found it not inferior to Sardes (iii. 5). It resisted Alexander two months in 332. After the battle of Ipsus (301) the Philistine cities remained in the hands of the Ptolemies until the battle of Panium (200), when the Seleucids gained possession of all Syria. Jonathan, the Hasmonæan, burned Ashdod with its great Dagon temple, and captured Ashkelon in 147. (1 Macc. x. 75 ff.) Alexander Balas gave him Ekron, and he later besieged Gaza. Simon took Joppa and Gezer, and Alexander Jannæus conquered Raphia, Anthedon, and Gaza in 96 B.C. Pompey delivered these cities from Jewish rule in 63 B.C. Mark Antony bestowed them on Cleopatra in 36 B.C., and Augustus gave Gaza, Anthedon, and Joppa to Herod in 30 B.C. Ashdod and Jamnia were given to Salome in 6 A.D. During the war with Rome (66-70) the Philistine cities suffered much from riots

created by the pagans or by the Jews. Especially Ashkelon and Gaza were flourishing centres of Hellenic civilization throughout the Roman and Byzantine periods.

The racial affinities of the Philistines are involved in the obscurity that still rests on the populations preceding the Greeks in the Aegean. Their physiognomy, dress, and arms are known from the pictorial representations of them by the Egyptians, and there is much similarity between them and other Mediterranean or Asiatic peoples. Like them, they did not practice circumcision, which was a marked characteristic of the Egyptians and the other peoples in Syria. Of their original language nothing is known; the name Achish and the title *seren*, from which *tyrannos*, *tyrannos*, may have come, furnish no clew. In Syria they adopted the speech of Canaan, and later this language yielded to the Aramaic, Greek, and Arabic. The Ashdodite speech differed from that of Jerusalem in the time of Nehemiah (xiii. 22), but it is not certain how far real dialectical distinctions are meant rather than mere differences of pronunciation. The Philistines were somewhat advanced in civilization when they came to Syria, had chariots of war, apparently used iron tools and weapons, probably had a system of writing, and possessed a marked capacity for political organization. They seem to have adopted the gods of the land, Dagon, Atar Ate (Derketo), and others, no doubt identifying them with their native deities. The racial stock, superimposed on the Canaanitish, was modified by intermarriages with the Hebrews and later by ethnic elements deported into the country by the Assyrians, by Macedonian and Greek settlers, and by Arabs, but undoubtedly retained some of its characteristics, probably even after the Moslem conquest. See Ashdon, ASHKELON, EKRON; GATH, GAZA.

Bibliography. K. B. Stark, *Gaza und die philistäische Küste* (Jena, 1852); Friedrich Schwallby, "Die Rasse der Philister," in *Zeitschrift für wissenschaftliche Theologie*, vol. xxiv (Leipzig, 1891); W. M. Müller, *Asien und Europa* (ib., 1893); id., in *Mitteilungen der Vorderasiatischen Gesellschaft*, vol. v (Berlin, 1900); Hugo Winckler, *Geschichte Israels* (Leipzig, 1895-1900); Emil Schürer, *Geschichte des jüdischen Volkes* (4th ed., 4 vols., ib., 1901-11; Eng. trans. of 1st ed., 5 vols., New York, 1896); G. F. Moore, "Philistines," in *Encyclopædia Biblica* (New York, 1902); A. Noordtzi, *De Filistijnen* (Kampen, 1905); M. A. Meyer, *A History of Gaza* (New York, 1907); D. G. Hogarth, *Ionian and the East* (Oxford, 1909); R. A. S. McAlister, *The Philistines: Their History and Civilization* (London, 1914).

PHILISTINISM. A term made popular in England and America by Matthew Arnold. The allusion is to the ancient Philistines, the enemies of the "children of light", hence Philistinism, in its modern application, means stolid opposition to the higher intelligence of the age, inaccessibility to ideas; plain, humdrum, respectable conventionalism. The German students first applied the term *Philister* to a townsman or to one who had not been trained in a university; it soon found a foothold in German literature, and reached England through Carlyle. The term has been used so indiscriminately by persons self-complacently wise in their own conceit that one may now

almost accept Leslie Stephen's definition of it as "a term of contempt applied by prize to the rest of their species." Consult Arnold, "Heine," in *Essays in Criticism*, 1st series (Oxford, 1885).

PHILISTUS (Lat., from Gk. Φίλιστος) (c. 435-c. 356 B.C.). A Greek historian of Syracuse. He assisted the elder Dionysius in securing and maintaining supreme power in Syracuse (c. 405 B.C.), but in 386 was banished for marrying a niece of the tyrant without the latter's consent. Recalled soon after the accession of Dionysius the younger, he brought about the banishment of Dion and Plato and, according to the latter, employed his talents in defense of the despotic policy of Dionysius. In 356 B.C., however, he was defeated in a naval battle by Dion and the revolted Syracusans, and either committed suicide or was killed by the populace. He left *Sicelica* (Σικελικά), a history of Sicily from the earliest times to 362 B.C., in 11 books, begun while he was in exile. According to the testimony of the ancients, by whom he is frequently mentioned, he sought in this work to palliate the despotic deeds of Dionysius, in order to secure his own return from exile. In style he was a close, though unsuccessful, imitator of Thucydides. The few extant fragments of Philistus are edited in C. Müller's *Fragmenta Historicorum Graecorum*, vol. i (Paris, 1841). Consult: E. A. Freeman, *History of Sicily*, vol. iv (Oxford, 1894); J. B. Bury, *The Ancient Greek Historians* (New York, 1909); Christ-Schmid, *Geschichte der griechischen Literatur*, vol. i (6th ed., Munich, 1912).

PHILITAS. See PHILETAS.

PHILLE'O, MRS. PRUDENCE CRANDALL. See CRANDALL.

PHIL/LIMORE, JOHN SWINNERTON (1873-). An English classical scholar. He was educated at Westminster School and at Christ Church, Oxford; was lecturer at Christ Church in 1895 and tutor there in 1896-99; and at the University of Glasgow he was professor of Greek (1899-1906) and thereafter professor of humanity. In 1914-15 he held the Sather professorship of classics at the University of California. His publications include an edition of the text of Propertius, in the "Oxford Classical Texts Series" (1901); an Index Verborum to Propertius and a translation of that author (1906); *Poems* (1902); a text of the *Silvae* of Statius (1905); and a translation of *The Life of Apollonius of Tyana*, by Flavius Philostratus (2 vols., 1912).

PHILLIMORE, SIR ROBERT JOSEPH (1810-85). An English jurist, born in London. He was educated at Westminster School and at Christ Church, Oxford, where he graduated in 1831, and then became a clerk of the Board of Control. Soon afterward he was called to the bar, where he acquired a large practice, and was made a queen's counsel. In 1844 he became chancellor of the diocese of Chichester, and later was a member of Parliament. He was made judge of the Cinque Ports in 1855, Advocate General in Admiralty in 1862, when he was knighted, and in 1867 judge of the High Court of Admiralty and of the Arches Court of Canterbury. He was Judge-Advocate-General (1871-73), and was made Master of the Faculties in the latter year. On the reorganization of the judicial system of the Kingdom in 1875 he resigned his other offices and was appointed judge of the Admiralty and Probate Division of

the High Court of Justice, retiring in 1880. The most valuable of his numerous legal works is his *Commentaries upon International Law* (4 vols., 3d ed., London, 1879-89). Among his other writings are *Memoirs and Correspondence of George, Lord Lyttelton, 1734-73* (ib., 1845), and *The Ecclesiastical Law of the Church of England* (2d ed., ib., 1895), founded upon a work by Burn.

PHILLIMORE, SIR WALTER GEORGE FRANK (1846-). An English jurist, son of Sir Robert Joseph Phillimore, born in London. He was educated at Oxford, where he had a particularly distinguished career, became a barrister of the Middle Temple in 1868, and received the Patent of Precedence there in 1883. He stood high in ecclesiastical circles as vice president of the English Church Union and chancellor of the diocese of Lincoln. From 1897 to 1913 he was judge of the Queen's Bench Division of the High Court of Justice, and thereafter he served as a Lord of Appeal. He revised J. H. Blunt's *Book of Church Law* in 1873 and edited his father's *Ecclesiastical Law of the Church of England* and a third edition of volume iv of that author's *International Law*.

PHILLIP, JOHN (1817-67). A Scottish genre and portrait painter. He was born at Aberdeen, April 19, 1817. His boyhood was spent in poverty, but his remarkable talent attracted the attention of Lord Panmure, who enabled him to study at the Royal Academy. He at first painted Scottish genre subjects in the manner of David Wilkie, but a voyage to Spain in the summer of 1851-52, made for the benefit of his delicate health, completely changed his style. Influenced by Velazquez and by the bright colors of nature about him, he adopted the rich coloring, breadth, and vivacity by which his best works are distinguished. He received a number of royal commissions, among which was a large ceremonial picture, "The Marriage of the Princess Royal with the Crown Prince of Germany" (1860). He visited Spain in 1856-57 and again in 1860, his last visit being a time of great artistic activity. Among the best paintings of his early period are "Presbyterian Catechizing" (1847) and "Baptism in Scotland" (1850). After his visit to Spain he executed "The Spanish Gypsy Mother" (1853), the "Letter-Writer of Seville," and the "Dying Contrabandista" (1858), all in the royal collection. Other important works are: the "Prison Window" (1857) and "The Promise," both in the Tate Gallery; "La Bomba" (1862-63); "Il Cigarello: A Chat around the Braserio" (Guildhall); and his masterpiece, "La Gloria" (1864), in the National Gallery of Scotland. In the Metropolitan Museum, New York, is his "Gossips at the Well." He produced also a number of forceful portraits, including those of Sir J. E. Millais (1843), the Prince Consort (1858), Miss Caird (1866), and Mr. W. B. Johnston and his wife, National Gallery, Edinburgh. See Plate of FARADAY, MICHAEL.

PHILLIPPS, JAMES ORCHARD HALLIWELL. See HALLIWELL-PHILLIPPS, J. O.

PHILLIPS. The name of a family identified with the founding of Phillips Academy (q.v.).—**SAMUEL, JR.** (1751-1802), politician and philanthropist, was born at Andover, Mass. He was graduated at Harvard in 1771 and was elected in 1775 to the Provincial Congress, of which

he continued to be a member until 1780, when he was elected a member of the Massachusetts State Senate, of which for 17 years (1785-1802) he was presiding officer. From 1781 until 1798 he was also judge of the Court of Common Pleas for Essex County, and in 1801 he was elected Lieutenant Governor by the Federalists (q.v.). He is best known, however, as the founder of Phillips Academy at Andover in 1778. In this project he interested his father, **SAMUEL** (1715-90), who was graduated at Harvard in 1734 and who afterward represented Andover in the General Court; his uncles, **JOHN** (1719-95), who graduated at Harvard in 1735, settled at Exeter and was for many years a member of the Council of New Hampshire, and **WILLIAM** (1722-1804), who held important political offices in Massachusetts; and the son of the last named, **WILLIAM, JR.** (1750-1827), who was in 12 successive elections chosen Lieutenant Governor of Massachusetts. Their liberality enabled the academy to take a high position from the day of its opening. A few years later John Phillips, who was childless, founded at Exeter a similar academy, to which at his death he bequeathed two-thirds of his estate, the remaining third going to Phillips Academy at Andover. During his lifetime he also endowed a professorship at Dartmouth College and made liberal gifts to Princeton.

PHILLIPS, DAVID GRAHAM (1867-1911). An American novelist, born in Madison, Ind. After his graduation from Princeton University in 1887 he turned to journalism, at first in Cincinnati and later in New York, where he was reporter on the *Sun*. This position he gave up to assume the duties of London correspondent for the *New York World*, and to work for a time as Joseph Pulitzer's private secretary. On his return to America he worked editorially and miscellaneously for the *World*. His first published novel was *The Great God Success* (1901), which brought to an end his newspaper work and opened a rather prolific career as a novelist, a career cut short by the shot of a mad assassin, Jan. 24, 1911. If not a novelist of the first order, there was talent in Phillips's books, which generally addressed themselves to pressing ethical and social problems of the day; they were thought-provoking and, to a considerable audience, highly interesting. *The Husband's Story* (1910) is representative of this author at his best; he may also be read to great advantage in *The Second Generation* (1907); *Old Wives for New* (1908); *The Hungry Heart* (1909). Other books of his are *Her Serene Highness* (1902); *Golden Fleece* (1903); *The Social Secretary* (1905); *The Fortune Hunter* (1906); *Light-Fingered Gentry* (1907); *The Worth of a Woman* (1908); *The Grain of Dust* (1911). Consult F. T. Cooper, *Some American Story-Tellers* (New York, 1911), and J. C. Underwood, *Literature and Insurgency* (ib., 1914).

PHILLIPS, EDWARD (1830-c.96). An English compiler, the biographer of his uncle, John Milton. The poet's elder and only sister, Ann, on her second marriage left her two sons by her first to the care of her brother, who took them to his house in Aldersgate Street. Edward was then 10 years old, his brother John a year younger, and besides his nephews Milton took in other pupils. Edward ceased studying with him in 1846 and two years afterward went to Oxford, where he departed from his Puritan training

and joined himself to the Cavalier party. Edward expressed his royalist sentiments in *The Mysteries of Love and Eloquence*, etc. (1658), containing certain verses that are not original, and to record the Restoration he wrote a *Continuation* (1665) to Barker's *Chronicle of the Kings of England*, which had stopped at 1641. He edited the poems of Drummond of Hawthornden (1656), compiled a dictionary (1658), and was tutor in more than one noble household, but was often obliged to support himself and his family by making compilations and translations. John Phillips never became reconciled to his uncle, but Edward did. He was the first to praise *Paradise Lost* in the press, spoke in the highest terms of its author in his *Theatrum Poetarum* (1675), and wrote the scant but appreciative *Life of Milton* which was prefixed to the *Letters of State* (1694).

PHILLIPS, JOHN (1676-1709). See **PHILLIPS, JOHN**.

PHILLIPS, JOHN (1800-74). An English geologist, born in Wiltshire. After receiving an elementary education he joined his uncle, William Smith, in geological investigations in various parts of England. In 1825 he received the curatorship of the Yorkshire Philosophical Society, and in 1834 became professor of geology at King's College, London. Resigning this office in 1840, he served successively as geologist on the survey of Great Britain, professor of geology at Trinity College, Dublin, and at Oxford, and as keeper of the Ashmolean Museum. He was president of the Geological Society in 1859-60. He contributed numerous papers to scientific journals and wrote also the following separate works: *Illustrative of the Geology of Yorkshire* (1822-36); *Guide to Geology* (1834); *Treatise on Geology* (1837); *Geological Map of the British Isles* (1842); *Memoirs of William Smith* (1844); *Vesuvius* (1869); *The Geology of Oxford and the Valley of the Thames* (1871).

PHILLIPS, JOHN ARTHUR (1822-87). An English geologist, born at Polgooth, near St Austell, Cornwall, and educated at the Paris School of Mines. He received the appointment of chemist to the Admiralty commission engaged in finding the most suitable coal for burning at sea, and afterward made valuable researches in mineralogy. He inspected gold mines in California and elsewhere, and between 1875 and 1878 wrote a series of important monographs on the rocks of his native country. He published *The Mining and Metallurgy of Gold and Silver* (1867) and *The Elements of Metallurgy* (1874), but his chief work was *A Treatise on Ore Deposits* (1884).

PHILLIPS, PHILIP (1834-95). A Methodist evangelist and singer. He was born in Chautauqua Co., N. Y. After the age of 19 he devoted all his time to the study and use of music. During the Civil War he sang much for the benefit of the Christian Commission; he became musical editor for the Methodist Book Concern in 1866, and made a musical tour around the world in 1872, holding evenings of song in all lands. On his return he gave 200 nights for the Sunday-school Union in England; subsequently he traveled with D. L. Moody, the evangelist. He produced a number of hymn books, such as *Early Blossoms* (1860); *The Singing Pilgrim* (1866); *American Sacred Songster*, prepared for the British Sunday-school Union (1868); *Hallowed Songs* (1871); *Our New Hymnal* (1894); and, with his son, *Bright*

Gems (1895). Several of these collections had a very large sale.

PHILLIPS, STEPHEN (1868-1915). An English poet, born at Somertown, near Oxford, July 28, 1868. Having attended the grammar schools at Stratford-on-Avon and at Peterborough, where his father was precentor of the cathedral, Phillips studied for the civil service, but entered Queens' College, Cambridge, in 1886. At the end of the first term he joined F. R. Benson's company of Shakespearean players, with whom he remained six years, traveling through the country and also playing at the Globe Theatre in London. Among his parts were Iago, the Ghost in *Hamlet*, Prospero, Brutus, and Sir Andrew Aguecheek. Leaving the stage, he became a lecturer on English history in Wolfgram and Needham's classes for army candidates, but soon adopted literature as a profession. In June, 1890, with three other authors, he published in London a booklet of verse entitled *Primavera*. In 1894 followed *Eremus*, which won the praise of Symonds, Jowett, and Stopford Brooke. *Christ in Hades, and Other Poems* (1896; 4th ed., with additions, 1897) and *Poems* (1897), containing "Marpessa," secured for the author a very high rank among poets of his time. The *Poems* won from the London Academy the award of 100 guineas for the best verse of the year. Commissioned by George Alexander to write a verse tragedy for St. James's Theatre, Phillips composed *Paolo and Francesca* (1899). The blank verse of this lyric tragedy recalls the Elizabethans, but its simple structure is more nearly akin to the French classic drama. For Beerbohm Tree Phillips wrote his second play, *Herod* (1900), a tragedy. *Ulysses*, a dramatic poem, appeared in 1902, *The Sin of David* in 1904, *Nero* in 1906. Subsequently were published: *The Last Heir* (1908); *Pietro of Siena* (1910); *The King* (1912); *Iole* (1913); *Lyrics and Dramas* (1913); *Panama and Other Poems* (1915); *Armageddon* (1915), a war play. Consult: William Archer, *Poets of the Younger Generation* (New York, 1902); id., *Real Conversations* (London, 1904); E. E. Hale, Jr., *Dramatists of To-day* (6th ed., New York, 1911).

PHILLIPS, THOMAS (1770-1845). An English portrait and historical painter, born at Dudley, Warwickshire. He was a pupil of Francis Eginton, a glass painter of Birmingham, and afterward worked under Benjamin West on the windows of St. George's Chapel, Windsor. He began to exhibit landscapes and historical paintings at the Royal Academy in 1792 and was elected to that institution in 1808. There he succeeded Fuseli as professor of painting, and his *Lectures on the History and Principles of Painting* were published in 1833. After 1796 he devoted himself chiefly to painting portraits. Among his distinguished sitters were the Prince of Wales, William Blake (in the National Portrait Gallery), Napoleon (at Petworth), Lord Byron (two portraits), and many other celebrities of the time.

PHILLIPS, THOMAS W. (1835-1912). An American capitalist and Congressman, born at Mount Jackson, Pa. He became one of the largest individual petroleum producers in the United States and was active in philanthropic work. Becoming interested in politics, he originated the campaign textbook, first used in the Garfield campaign of 1880. He served in the Fifty-third and Fifty-fourth Congresses (1893-

97) and introduced the bill that created the Industrial Commission, of which he became a member. In 1902 Phillips made a supplementary report to that of the commission, this report attracting attention so widespread that it led to the creation of the Bureau of Corporations.

PHILLIPS, WALTER ALISON (1864-). An English historian, educated at Merton College, Oxford. He was chief assistant editor and history departmental editor on the eleventh edition of the *Encyclopædia Britannica*, special correspondent of the *London Times* in South America in 1912, and editor of the *Times's* South American supplement in 1913. In 1914 he became Lecky professor of modern history at Trinity College, Dublin. He wrote on the early years of nineteenth-century history, especially diplomatic: *The War of Greek Independence* (1897); *Modern Europe 1815-1899* (1901); *George Canning* (1902); *The Confederation of Europe* (1914).

PHILLIPS, WENDELL (1811-84). An eminent American orator and reformer, born in Boston. He was educated at Harvard, graduating in 1831, the year of the first appearance of the *Liberator*. After a three years' course at the Cambridge Law School he was admitted to the Suffolk County bar, but he was little interested in professional eminence. On Oct. 21, 1835, from his office window he indignantly saw Garrison dragged at a rope's end by a respectable mob, in 1836 he joined the Abolitionists, and thereafter was occasionally heard at meetings of the American Anti-Slavery Society. He came at once into prominence by his Faneuil Hall speech of Dec. 8, 1837. At the instance of Dr. W. E. Channing a public assembly had convened to protest in a suitable manner against the murder of the Rev. E. P. Lovejoy (q.v.) at Alton, Ill. This purpose seemed likely to be defeated by J. T. Austin, Attorney-General of Massachusetts, who commended the Alton rioters and affirmed that Lovejoy "died as the fool dieth." To this Phillips made a brilliant and crushing reply, whose eloquence he never surpassed, and which has been ranked by Curtis with Henry's oration at Williamsburg and Lincoln's Gettysburg address. From that time he was an antislavery leader, preeminently the orator of the movement. In 1839 he withdrew from the practice of law through scruples against compliance with the attorney's oath to the Constitution, and later he refused to stand for a Congress which he could not enter without swearing allegiance to that same Constitution. He called for the immediate and complete abolition of slavery, declared the Church *particeps criminis* for its attempt to justify slavery by the Scriptures, opposed colonization for the negro, discontinued voting, and regarded disunion as the best means for accomplishing emancipation. He was not, however, like Garrison, a nonresistant. In the Abolitionist divisions of 1839-40 he with Garrison opposed the organization of the Abolitionists into a political party and the attempt to bar any from the antislavery platform on the ground of religious beliefs. In 1840 he was the representative of the Massachusetts Abolitionists at the London World's Antislavery Convention. Differences arose between himself and Garrison in 1864 in regard to Lincoln's reelection, which he did not favor; and in 1865 these differences were renewed when he advocated and Garrison opposed

the continuance of the Antislavery Society. His contention was that the work of the society was not finished until the negro obtained the suffrage. As a result he was elected, in Garrison's stead, (1865) to the presidency of the society, which was dissolved in April, 1870, on the passing of the Fifteenth Amendment. Phillips was prominently active in the various controversies of the Reconstruction. He spoke in behalf of Ireland, of Crete, of the Indian, prison reform, also of the abolition of capital punishment, prohibitory legislation regulating the sale of liquor, the greenback theory, and in connection with the labor question urged that vast combinations of capital with unlimited monopolies and powers tend to make the rich richer and the poor poorer. In 1870 he received about 20,000 ballots as labor reform and temperance candidate for the governorship of Massachusetts.

Phillips must be compared among American orators to Everett, Clay, and Webster; and his achievement is, perhaps, to be reckoned greater than that of any of these when it is considered that, whereas they represented a strong political organization or powerful conservative opinion, he attacked existing prejudices and institutions, for years spoke to hostile audiences, was denounced by the two great parties and belonged to none. His manner was that of "simple colloquy," so that Greeley said Phillips made one think it easy to be an orator. His voice was in the baritone register, used largely in what elocutionists call the upper chest notes, and remarkable not so much for its compass, volume, or intensity as for its timbre. In gesture or general action he was sparing. He seldom employed the dramatic mode of expression. But in invective or epigram he was unsurpassed, he possessed wit, which most other notable American orators have lacked, and he told an anecdote with much skill. Phillips was not a scholar in the restricted sense, for this the demands made upon his time as a public speaker did not permit. But his reading was considerable, and he could always find illustrative material in the one subject he was accustomed to say he knew thoroughly, the great English Revolution. In addition to his antislavery and other reform speeches, he appeared in various lyceum addresses, the most noteworthy of which are *The Lost Arts*, *Toussaint l'Ouverture*, and *Daniel O'Connell*, and in 1881 he made a distinguished oration on *The Scholar in a Republic* at the centennial anniversary of the Phi Beta Kappa of Harvard. During antislavery days he always offered to speak without remuneration and to pay his expenses if he might use antislavery for a literary subject. He wrote for the *Liberator* and the *Antislavery Standard* and published a number of pamphlets, including *The Constitution a Proslavery Compact* (1844); *Can Abolitionists Vote or Take Office under the United States Constitution?* (1845); *Review of Spooner's Unconstitutionality of Slavery* (1847); *Review of Webster's Seventh-of-March Speech* (1850); *Review of Kosciuszko's Course* (1851); *Defense of the Antislavery Movement* (1853). Collections of *Speeches, Lectures, and Letters* have appeared at Boston, the first series, edited by James Redpath, in 1864, the second by T. C. Pease in 1892. These are edited from the best stenographic reports. Consult: W. C. Martin, *Wendell Phillips, the Agitator*, in "American Re-

formers" (New York, 1890); G. L. Austin, *Life and Times of Wendell Phillips* (new ed., Boston, 1893); Lorenzo Sears, *Wendell Phillips* (New York, 1909); C. E. Russell, *The Story of Wendell Phillips, Soldier of the Common Good* (Chicago, 1914); also works dealing with the antislavery struggle.

PHILLIPS, WILLIAM (1775-1828). An English mineralogist, born in London. He was one of the founders of the Geological Society of London in 1807, and became a fellow of the Royal Society in 1827. His writings on mineralogy and geology were the standard textbooks of his day. These included: *Outlines of Mineralogy and Geology* (1815; 4th ed., 1826); *Elementary Introduction to the Knowledge of Mineralogy* (1816; 3d ed., 1823); *A Selection of Facts from the Best Authorities, Arranged so as to Form an Outline of the Geology of England and Wales* (1818), which was made the basis of a joint work by W. D. Conybeare and Phillips under the title *Outlines of the Geology of England and Wales* (1822).

PHILLIPS ACADEMY, ANDOVER. A boys' school at Andover, Mass., commonly known as **PHILLIPS ANDOVER**. It was founded and opened in 1778 through the gifts of members of the Phillips family. The school was incorporated in 1780, and in 1807 the trustees were empowered to receive and hold funds for a separate theological institution, and the Andover Theological Seminary was accordingly established in the following year. In 1830 the Teachers' Seminary was established in anticipation of the normal schools, but in 1842 it was merged in the parent academy and is its present scientific department. In 1901 an archaeological department, with valuable collections and an endowment for instruction, research, and publication, was established by two anonymous donors. The academy, with its sister institution at Exeter, has always been regarded as a typically democratic American school. During the early years of its history it had as students many of the famous men of the country. The equipment has in recent years been largely increased by new buildings, among them several dormitories and a gymnasium. The standards of Yale and Harvard, to which most of the graduates go, form the basis on which the work of the school is arranged. The academy had in 1915 an attendance of 558 and 40 instructors. The endowment was \$1,460,000, and the academy property was estimated at \$1,903,450. The library contained 8674 volumes. In 1915 the president was Alfred Lawrence Ripley, A.M.

PHILLIPSASTRÆA. A genus of fossil corals found in the Devonian and Carboniferous rocks of America and Europe. They have large colonies of corallites united by confluent septa and are objects of great beauty, especially when polished.

PHILLIPSBURG. A town in Warren Co., N. J., on the Delaware River, opposite Easton, Pa., and on the Pennsylvania, the Lehigh Valley, the Lehigh and Hudson River, the Lackawanna, and the Central of New Jersey railroads (Map: New Jersey, B 2). It possesses valuable advantages for an industrial centre, the river affording good water power and the railroads making accessible a supply of coal and iron ore. Its manufacturing interests are extensive and include shops of three of the railroads that enter the town, also iron fur-

naces, sheet-iron mills, foundries and machine shops, stove works, boiler works, horseshoe mills, drill works, and large silk mills. Settled in 1749, Phillipsburg was incorporated in 1861, and adopted the commission form of government in 1914. Two street-car lines are owned by the city. Pop., 1900, 10,052; 1910, 12,803; 1915 (State census), 15,430.

PHILLIPS EXETER ACADEMY. One of the oldest boys' schools in the United States, founded at Exeter in 1781 and opened for students in 1783. It is commonly known as **PHILLIPS EXETER**. The school was the first educational institution incorporated by the Legislature of New Hampshire and takes its name from John Phillips, its founder, who was also a generous benefactor of Dartmouth College and of Phillips Academy (q.v.), Andover, Mass. The school early gained a national reputation, which it has always retained. It draws students from all parts of the country. The alumni in 1915 numbered nearly 10,000. Among the earlier graduates were Daniel Webster, George Bancroft, Edward Everett, John A. Dix, and Jared Sparks. There were enrolled in 1914-15 573 students, and the faculty numbered 32. The school buildings include well-equipped laboratories, fine dormitories, an administration building, a gymnasium, a library, an infirmary, a boathouse, a dining hall, and a graduates' house, designed for the entertainment of visiting alumni and other friends. The buildings with their equipments are valued at about \$1,000,000, and the endowment exceeds \$500,000. The recreation grounds, 300 acres or more, are of unusual extent and beauty.

PHILLIPSIA. A genus of trilobites that attained its maximum development in the Lower Carboniferous but continued down to Permian time, when it was represented by the last-surviving species of the trilobites. It resembles *Proetus*, but has a more prominent glabella and a larger, more segmented pygidium. See **TRILOBITES**.

PHILLIPOTS, EDEN (1862-). An English novelist, son of Capt. Henry Phillipots. He was born at Mount Abou in India, Nov. 4, 1862, and was educated at Plymouth, England. At the age of 18 he became clerk in the Sun Fire Insurance office, a position which he held for 10 years. A number of earlier novels were followed by two considerable successes, *Lying Prophets* (1896) and *Children of the Mist* (1898). In these novels Phillipots depicted Devonshire life with remarkable power and beauty. In their coloring they recall Blackmore and in their tragedy they are akin to Hardy. These successes were followed by *The Human Boy* (1899); *Sons of the Morning* (1900); *The Striking Hours* (1901); *The Good Red Earth* (1901); *The River* (1902); *The Secret Woman* (1905); *The Portreeve* (1906); *The Haven* (1909); *The Dance of the Months* (1911); *The Forest on the Hill* (1912); *The Joy of Youth* (1913); *Brunel's Tower* (1915); three plays in *Modern Plays* (1914); *Old Delabole* (1915); and a volume on gardening, *My Shrubs* (1915).

PHILLIPOTS, HENRY (1778-1869). An English bishop, born at Bridgewater, Somerset. He was graduated B.A. at Corpus Christi College, Oxford, in 1795, and M.A. at Magdalen College in 1798. From 1806 to 1826 he was one of the chaplains of Shute Barrington, Bishop of Durham. In 1825 he engaged in a notable controversy with Charles Butler, in

which he opposed removing the political disabilities from Roman Catholics. From 1830 until his death he served as Bishop of Exeter, and in that capacity was involved in several famous lawsuits with his clergy over ecclesiastical matters.

PHILO. See **PHILO JUDEUS.**

PHILOBIBLON. A prose treatise in praise of books and learning by Richard Aungerville, known as Richard de Bury, Bishop of Durham (1345). It was printed first at Cologne in 1443, at Paris in 1500, and at Oxford in 1599. The latest English translation is that of E. C. Thomas (London, 1885).

PHILO BYBLIUS. See **SANCHUNIATHON**.

PHILOCHORUS (Lat., from Gk. Φιλόχορος). A Greek historian who is said to have lived at Athens between 306 and 260 B.C. According to Suidas he was one of the bitterest opponents of Demetrius Poliorcetes and of his son, Antigonus Gonatas, and was put to death by the latter after the conquest of Athens (c.260 B.C.). He is known chiefly by his *Atthis*, a history of Athens from the earliest times to 262 B.C., in 17 books. Important fragments are preserved in Müller's *Fragmenta Historicorum Græcorum* (Paris, 1841). Consult: Julius Strenge, *Quæstiones Philochoræ* (Göttingen, 1868); Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (6th ed., Munich, 1911); also the edition of Philochorus by M. C. G. Siebelis (Leipzig, 1811).

PHILOCTETES (Lat., from Gk. Φιλοκτήτης, *Philoktētēs*). A Greek chieftain who inherited the bow and arrows of Heracles. He started with seven ships for the Trojan War, but was bitten on the way by a serpent at Lemnos. On account of the stench of the wound the other Greeks left him behind and went on to Troy. As an oracle, however, declared that Troy could be taken only by the arrows of Heracles, Odysseus and Diomedes went to Lemnos to fetch Philoctetes. He accompanied them to Troy, was healed by Machaon, slew Paris, and returned safely home. The drama *Philoctetes* by Sophocles is still extant. The legend was dramatized also by Æschylus and Euripides.

PHILODEMUS (Lat., from Gk. Φιλόδημος). An Epicurean philosopher of the first century B.C., born at Gadara in Syria. Besides 34 epigrams, mostly erotic, preserved in the Greek anthology, Philodemus wrote works on philosophy; treatises ascribed to him, much mutilated, were discovered at Herculaneum. Among these are: *De Rhetorica*, edited by Gros (1840) and by Sudhaus (1892-95); *De Musica*, edited by Kempke (1884); *De Vitius*, edited by Götting (1830) and Ussing (1868); *De Ira* and *De Pietate*, edited by Gomperz (1864-66); *De Morte*, edited by Mekler (1886). Martha makes him the editor of Lucretius, and many attempts have been made to prove that Cicero got his knowledge of Epicureanism from Philodemus and so from Zeno. Consult Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (6th ed., Munich, 1911).

PHILODENDRON. See **PLATE** of **EPHYTES**.

PHILO JUDEUS (Lat., from Gk. Φίλων Ἰουδαῖος, *Philōn Ioudaios*, Philo the Jew). A Jewish-Hellenistic philosopher, born at Alexandria about 25 B.C. He belonged to one of the most wealthy and aristocratic families—his brother Alexander was the alabarch or president of the Jewish colony at Alexandria—and

he received the most careful Jewish education, consisting largely of a study of the Old Testament in the Septuagint version. He became acquainted with the writings of the Greek philosophers also. He went to Rome, 39 or 40 A.D., as the advocate of his Alexandrian brethren, who had refused to worship Caligula in obedience to the Imperial edict. He has left an account of this embassy, the result of which was not satisfactory. Of his life we know little except what is recorded above.

While strict in all that pertained to ceremonial and ritual, in doctrinal matters Philo was a bold allegorizer. A literal interpretation of the Scriptures he regarded as superstitious and mean. Especially did he explain away all theophanies recorded in the Old Testament, as told in accommodation to the sensuous character of human minds, which needed anthropomorphic representations of supersensible truth.

His writings develop his ideas and his system in the two directions indicated. In that division of his writings principally which treats of the creation (*Κοσμοποια*), he allows allegory to take the reins out of his hands; in that on the laws (*Νομοί*), on the other hand, he remains remarkably sober and clear, extolling the Mosaic legislation throughout, at the expense of every other known to him. In a very few instances only he is induced to find fault, or to alter slightly, by way of allegory, the existing ordinances.

His idea of God is a preëminently theosophic, not a philosophic one. God alone is the real good, the perfect, only to be imagined as the primeval light, which cannot be seen by itself, but may be known from its rays, that fill the whole world. He has no attributes and therefore no name, and reveals himself only in designations expressive of this inexpressibility. He is better than virtue and knowledge, better than the beautiful and the good (*Kalokagathia*), simpler than the one, more blissful than bliss. He is the existing unity or existence itself, self-sufficient, free from pain and fear and participation in evils, and full of happiness. Dynamically God is omnipresent, but not really. Indeed, so far is God really from filling the world with his presence that the world, on the contrary, finds its place in God. And yet the God who comprehends within himself the material universe is so exalted above the world and so remote from it that a point of contact cannot be found between them; hence the need of an intermediate class of beings to stand between them. These were found in the spiritual world of ideas, which are not only ideals, or types, in the Platonic sense, but real, active powers, surrounding God like a number of attendant beings. They are his messengers, who work his will, and by the Greeks are called good demons; by Moses, angels. There are very many different degrees of perfection among them. Some are immediate serving angels; others are the souls of the pious, of the prophets and the people of Israel, who rise higher up to the deity; others again are the heads and chief representatives of the different nations, such as Israel does not need. The Logos comprises all these intermediate spiritual powers in his own essence. (See **LOGOS** for Philo's views on this part of his system.) Man is a microcosm, a little world in himself, a creation of the Logos, through whom he participates in the deity. Philo identified the ethical principles of Stoicism with

the Mosaic ethics, in which the ideal is most exalted moral perfectibility or sanctity, and man's duties consist in veneration of God and love and righteousness towards fellow men. Philo holds firmly the belief in immortality. Man is immortal by his heavenly nature; but as there are degrees in his divine nature, so there are degrees in his immortality, which then deserves this name only when it has been acquired by an eminence of virtue. There is a vast difference between the mere living after death, which is common to all mankind, and the future existence of the perfect ones. Virtue and sin both have all their rewards within themselves; but the soul, which is preëxisting, having finished its course in the sublunary world, carries the consciousness with it in a more intense and exalted manner. Paradise is oneness with God; there is no hell with bodily punishments for souls without a body, and no devil in the Philonic system. (For the relation between Philo as the representative of the Judeo-Alexandrian philosophy and other contemporary philosophic tendencies, see NEO-PLATONISM.) Of the many works left under his name, several have been declared spurious, but in some cases without much show of reason. His writings have been published by Richter (Leipzig, 1828-30) and by Tauchnitz (ib., 1851-54). The latest edition appeared under the editorship of Cohn and Wendland (Berlin, 1896-1906).

Bibliography. A. Gfrörer, *Philon und die alexandrinische Theosophie* (Stuttgart, 1831); A. F. Dähne, *Geschichtliche Darstellung der jüdisch-alexandrinischen Religionsphilosophie* (Halle, 1834); J. T. Delaunay, *Philo d'Alexandrie* (Paris, 1867); James Drummond, *Philo Judæus, or the Jewish-Alexandrian Philosophy in its Development and Completion* (2 vols., London, 1888); H. von Arnim, *Quellenstudien zu Philo Judæus* (Berlin, 1888); M. Freudenthal, *Die Erkenntnislehre Philos von Alexandria* (ib., 1892); J. Morton, *Philon* (Paris, 1907); K. S. Guthrie, *The Message of Philo-Judæus of Alexandria* (Chicago, 1909); N. D. Bentwick, *Philo-Judæus of Alexandria* (Philadelphia, 1910); and the standard histories of philosophy.

PHILOLAUS (Lat., from Gk. Φιλόλαος) (c.450 B.C.). A Pythagorean philosopher, born at Tarentum or Croton. Little is known of his life. Some fragmentary writings are attributed to him, in which he sets forth the teachings of Pythagoras. The authenticity of these writings has been the subject of serious study and of dispute among critics. To him is ascribed a knowledge of harmonic ratio and of the fact that the number of vertices of a cube is an harmonic mean between the number of faces and the number of edges. He seems also to have known with reasonable exactness the periods of revolution of the planets. Consult Boeckh, *Philolaus, des Pythagoræers Lehren, nebst den Bruchstücken seines Werkes* (Berlin, 1819), and Schaar-schmidt, *Die angebliche Schriftstellerei des Philolaus* (Bonn, 1864).

PHILOLOGICAL ASSOCIATION, AMERICAN. A learned society, organized at Poughkeepsie, N. Y., in July, 1869, from the classical section of the Oriental Society (q.v.), with Prof. William D. Whitney, of Yale, as the first president. Its object is the advancement and diffusion of philological knowledge. It has a membership of about 700, and its annual meetings are held in such cities as the society may select from year to year. The publications of the associa-

tion are annual volumes of *Transactions*, in which are printed in full such papers as the executive committee may select from year to year, and *Proceedings*, giving an account of the annual meeting and brief abstracts of other papers presented to the society.

PHILOLOGICAL SOCIETY, BRITISH. A learned society, founded in London in 1842 to investigate and promote the study and knowledge of the structure, the affinities, and the history of languages. It added to these objects the publication of the New English Dictionary, work upon which was begun in 1857, under the editorial charge of Dr. James A. H. Murray, assisted by many scholars and men of science in Great Britain and the United States. The first volume was published in 1888, and the bound volumes issued to 1914 bring the dictionary down to SH, though parts as far as TU have also been sent out in pamphlet form (July, 1915). The society has its headquarters at University College, London, and holds its annual meeting in May and monthly meetings from November to June, at which papers are read, the more important ones being afterward published in volumes of *Transactions*, distributed to members without charge, while summaries or synopses of the other papers are printed in the monthly *Abstract*, also published by the society.

PHILOLOGY (Lat. *philologia*, from Gk. φιλολογία, love of literature and learning, love of language and history, from φίλος, *philos*, dear + λόγος, *logos*, word). In modern English usage, the science of comparative linguistics. As speech may be studied either in its expression or in its origin, philology may occupy itself with linguistic expression, with literature, or with the genesis and laws of language. French and German scholars usually employ the word in the former sense, and many English scholars prefer to understand by philology the study of literary expression, even including all that is revealed through literature. Nevertheless, although this is perhaps the more legitimate use of the word, yet the tendency of the day, even among French scholars, and still more among English-speaking people, is to confine philology to the study of language and to divide this study into (a) linguistics proper, including phonetics, and (b) comparative philology, the study of language by a comparison of different languages in the same family. Languages may be divided roughly, and merely for convenience without scientific accuracy, into several types. Of these the most important are the isolating or monosyllabic, the agglutinative, with its subdivision the incorporating or synthetic, the inflectional, and the analytic. The isolating group, formerly supposed to be represented by Chinese, is characterized by invariable monosyllabic roots. The opinion which once considered this group to be the most primitive is now rejected by many who hold that the type represents, on the contrary, the culmination of a long linguistic evolution. The agglutinative type, which includes the majority of languages, such as the Dravidian, Malayo-Polynesian (qq.v.), Ural-Altaic (q.v.; see also FINNISH LANGUAGE), and African (q.v.), is marked by the addition of prefixes, suffixes, and infixes to the so-called root (q.v.) or base. These additions have, at least at first, distinct meanings of their own, but in course of time the meanings become obscured, the particles themselves become fused in signification with the base and lose their individuality. The result

is the type of language called inflectional. (See INFLECTION.) In the incorporating or polysynthetic languages, represented by the American Indian groups, the verb absorbs the noun, pronouns, adjectives, and adverbs, thus marking a higher degree of agglutination than the agglutinative languages themselves. The analytic languages are a development of the inflectional. In time the inflections tend to become weakened in force and to require the help of pronouns, prepositions, and auxiliary verbs. When the inflections have in the main disappeared and their places have been taken by individual words, the language is termed analytic. To this group belong such languages as English, French, Italian, Spanish, Persian, and Hindustani, as distinguished from the inflectional groups represented by the Semitic and Indo-European families, which include Hebrew, Arabic, Sanskrit, Greek, Latin, and German. It is, however, customary to confine comparative philology to the study of the group of Indo-European languages, though there is no reason why the term should not be applied to any other group as well. The different aspects of philology thus outlined are treated under different heads, to which the reader is referred for special discussion. See the articles ON LANGUAGE, for the psychology of language; ALBANIAN, ARMENIAN, CELTIC, INDO-IRANIAN, ETC., for special branches; and for classical philology, see the articles on GREEK LANGUAGE and ITALIC LANGUAGES.

History of Comparative Philology. Until the discovery of Sanskrit no comparative philology was possible. The French Jesuit Cœurdoux in 1767, Sir William Jones (q.v.) in 1786, and Schlegel in 1808 connected Sanskrit with Greek and Latin; but Franz Bopp (q.v.) first correlated the facts observed by others and founded the science. Approaching the subject from the philosophical side, Bopp devoted himself to glottogenic problems, his chief aim being to discover phonetic laws and the genesis of forms. He was at first influenced by Friedrich Schlegel (q.v.), and opposed the doctrine of mechanical affixes (called agglutination), holding rather to an inner inflection as the index of different relations, though he admitted into the root (in the aorist, etc.) the abstract verb *as*, *be*. But this view (1816) was soon changed, and Bopp in 1819 himself opposed this philosophy of language and taught that verbal endings, *-ti*, e.g., are really pronominal in origin. In his *Conjugations-system and Vergleichende Grammatik* (1833-52) he went still further, assuming a pronominal origin for case endings as well as verbal endings (*-s* of the nominative being *sa*, *he*, etc.). At one stroke, so to speak, Bopp formulated the method of historical explanation which was destined henceforth to take the place of the eighteenth-century theory of logical conceptions. Not only did this eminent philologist foresee the greater part of the comparisons of grammatical forms that can be made, but it is noteworthy also that not a single language of the Indo-European family escaped his attention. His mistakes consist principally in his neglect of the study of phonetic evolution as well as of the use of forms and the structure of the sentence. Bopp's monumental work was followed by the equally important *Geschichte der deutschen Sprache* (1819-48) of Jakob Grimm (q.v.), who with Rask (q.v.) extended the comparison of forms and discovered phonetic laws of change.

(See below.) Rask's work is more scientific and modern than that of Bopp, because he limited himself to showing the original identity of the languages compared without wasting any time in vain attempts to explain primitive forms. After Grimm the *Etymologische Forschungen* (1833-36) of Pott (q.v.) established a rationalized system of etymology for the whole group of Indo-European languages. Bopp, Grimm, and Pott may justly be called the creators of the comparative study of language. Agglutination, monosyllabic roots, *a*, *i*, *u*, as the three essential vowels, and a mother language—these characterize the belief of the first period of the study represented by them. This period extends to the appearance of Schleicher's (q.v.) *Compendium* (1861), which systematized the views of his predecessors while adding to them his own more stringent but false conception of language as a living organism which in his opinion should be studied by the methods of natural science. An increasing respect for phonetic law (q.v.) marks the close of this period, in which the names of Schleicher and Georg Curtius (q.v.), the latter being one of the first to insist on phonetic regularity, are most prominent. Different languages now began to be studied more carefully, each for itself, and the laws of each more strictly established. New problems arose, such as that of the parent language and primitive vocalism, but Schleicher accepted the views of his predecessors as regards the old problems. The parent speech Schleicher represented as the root of a tree, with trunk, branches, and twigs representing descendant languages and dialects (the so-called *Stammbaum-Theorie*). Like Curtius, he held that the simpler vocalism of Sanskrit was more antique than the variation shown in Europe, and believed that Sanskrit *a* was older than Greek *a*, *e*, *o*. Bopp and Pott instituted comparison, while Schleicher established the common language and determined its essential features as well as its evolution, though he made the fundamental mistake of seeing in this evolution a mere decadence.

Ten years later, in 1872, Johannes Schmidt (q.v.) published his *Verwandschaftsverhältnisse der indogermanischen Sprachen*, which put the interrelation of the different Indo-European languages in a new light. Instead of the *Stammbaum-Theorie* Schmidt set forth the *Wellentheorie*, according to which the different languages had rolled away like waves from a common centre. This view replaced Schleicher's and in a somewhat modified form has been adopted by Leskien, Schrader (qq.v.), and other scholars of the present day. According to it certain words and forms are explained as being common to one section till that splits up and so leaves the contiguous peoples in possession of a common linguistic property, while those dwelling farther apart possess linguistic property which, although originally practically identical, has become so differentiated as frequently to be mutually unintelligible. The obvious objection is that some wave segments may have lost material formerly possessed and others made for themselves what is also found in other segments. This change of view is paralleled by that in regard to vocalism. Instead of assuming that the primitive language had only *a*, *i*, *u*, and that Sanskrit *a* was an older phase as compared with Greek *a*, *e*, *o*, the scholars of the second period, which began about 1862, Brugmann, Osthoff, Col-

litz (qq.v.), and others, showed that the varied phase was older. From 1875 on the new period of development in the study of philology was thoroughly established. No longer was the explanation of primitive forms the essential object of linguistic research; the evolution of each language was henceforth the principal aim. The main efforts of philologists were directed towards the publication of texts, lexicons, and grammars, which gave much new material in many directions, notably in the Indo-Iranian field. Benfey, Roth, Böhlingk (qq.v.), Westphal, Curtius, and Max Müller (q.v.) thus furthered the cause of general comparative philology. At this time also began to be discussed afresh the problem of new formations. The answer to this was given in Whitney's enunciation of the theory of analogy (q.v.). By imitation of the old the new is produced. But especially were the scholars now calling themselves young grammarians insistent upon one principle which became a shibboleth. This was the invariability of phonetic law (q.v.). In the seventies and eighties the various philologists of note in Germany were more or less split up into cliques headed by Georg Curtius, Fick (q.v.), Schmidt, Brugmann, and others, but this was owing less to a radical difference than to personal feeling and may be passed over. In America Whitney (q.v.) centred his attention on the fundamental question of the origin and growth of language, and in so doing came into conflict with Max Müller. Müller claimed that language gives conceptions that could not exist without speech. Thought and word were, in his view, convertible terms. Whitney held, on the other hand, that words are only signs associated with conceptions and that every language known to us is a body of conventional signs for ideas. To Müller language study was a physical science, even in his final revision of the views first expressed in 1862. Language is, however, a human institution, not a physical science, and the failure to recognize this fact undermines the foundation of Müller's view. In one respect only was there an advance in Müller's system on Schleicher. He accepted the physical-science view of language, but he rejected the notion of a primitive Indo-European language from which Sanskrit, Greek, Latin, Germanic, Slavonic, and Celtic were derived, though even here he spoke of the mother language of the whole family. It is remarkable that German scholarship added little to the discussion of the fundamental questions of philology. An exception, however, must be made in favor of Paul (q.v.), whose *Prinzipien* (1880) discussed at length and acutely the causes leading to phonetic and morphologic changes. The great discoveries made by Verner (q.v.), De Saussure, Collitz, Brugmann, Hübschmann (q.v.), and others rendered necessary a complete revision of the comparative grammar of every language, and by 1880 the transformation was so complete that a fourth edition of the *Compendium* of Schleicher, published in 1874, was then considered antiquated. In 1886 Brugmann began his great *Grundriss*, which resumed and completed the work of the preceding 10 years. Since 1880, though a vast number of valuable details have been obtained, especially by Johannes Schmidt, and excellent manuals have appeared, no new principles of any importance have been introduced. During the past 30 years there have been two tendencies notice-

able in Germany. At Leipzig, under the influence of Curtius at first and then under that of Brugmann, there is a decided inclination towards pure linguistics and the preparation of systematic exposés of each question. Leipzig was the birthplace of the principal theories evolved from 1871 to 1880, and from this school have come the greater number of manuals and dictionaries in recent years. At Berlin, under the influence of Bopp, then J. Schmidt and W. Schulze, a keen desire has been manifested to examine directly philological facts and a disinclination to formulate general systems. But all of these tendencies serve only to complete each other. Outside of Germany there are only two important schools, the Russian, under the leadership of Baudouin de Courtenay and Fortunatov, and the French, founded by Bréal (q.v.) and continued by the brilliant De Saussure, who was professor at the Ecole des Hautes Etudes from 1881 to 1891. His distinguished pupil, Meillet (q.v.), has upheld these traditions. The method employed in the study of the Indo-European languages has also been applied with equal success to other families of languages, such as Semitic, Finno-Ugrian, African, etc.

Field of Investigation. Turning now from this historical outline of the growth of the science of philology to the subject matter of the science, it will be necessary first to explain the field of investigation. Comparative philology as applied to the Indo-European or Indo-Germanic languages (q.v.) first demarcates those languages from others. This family constitutes a single group, separated both by vocabulary and by structure from other groups of languages. Whether the Indo-European group had at any time a common origin with other groups passes human knowledge. Many scholars—Ascoli, Abel (qq.v.), and others—have made abortive attempts to connect Indo-European forms with Semitic, Mongolian, and Egyptian forms, but nothing cogent has been produced to show that there is any radical affinity between them, though there has often been connection. The name Indo-European is only one of many, but at present the usual one, to designate the group called in German quite as often Indo-Germanic and in English frequently Aryan (q.v.). The last name is one often used by German scholars to designate the narrower group of Indo-Iranian. The members of the Indo-European group are the subgroups known as Indic, Iranian, Anatolic, Hellenic, Celtic, Teutonic, Balto-Slavic. Some scholars add Albanian (q.v.) as a separate subgroup and some particularize Armenian as a subdivision on a par with Hellenic. (See below.) These subgroups include a great number of languages and dialects, various in themselves and in some cases intricately combined. The chief elements making each group are:

Indic. Sanskrit and the pre-Sanskrit Vedic language. The former name is often made to cover both divisions, but, like English in relation to Anglo-Saxon, though conveniently used, it is not accurate. There was no Sanskrit language (q.v.) till after the Vedic period. Whether Sanskrit is derived from the Vedic cannot be absolutely proved. It is closely connected with that earlier language, but it is quite possible that the two are dialectic variations from the start. Evidence given by the Linguistic Survey of India seems to show that there were two main Aryan invasions of India, entering by two different

routes and at different times; that those speaking the Vedic language were the first comers, afterward pressed to the wall by the ancestors of those who in course of time spoke what we call Sanskrit. Opposed to Sanskrit is Prakrit (q.v.), a general term for various dialects recognized at an early date as being not Sanskrit and yet not foreign. The language of Hinayana Buddhism, Pali (q.v.), was one of these patois. It is closely related to the Vedic language, and may be as old. Corresponding to the patois Prakrit dialects of antiquity are the modern provincial dialects, Bengali, Panjabi, Gujarāṭī, Hindustani, Marāṭhī, Uriya, Sindhi, Kashmirī, Nāipālī (q.v.), Pushtu (see AFGHAN), reflecting, however, more or less the effect of Sanskrit. A European offshoot of this division is the Gypsy language of Europe, many of whose words (verbal roots) are still identical with those of Sanskrit. (See GYPSIES.) The oldest literary remains of this group are from 1000 to 1200 B.C., though some scholars assign a much greater antiquity to the Vedas, the earliest Indic literature. See also PISAOA LANGUAGES.

Iranic. This group, the name of which is derived from Iran (Eran), the great plateau including Persia, Afghanistan, and Baluchistan, can be traced from quarters contiguous with the Indic group, and is closely connected with the latter. In fact, Indic and Iranic (Aryan in the narrower sense) are both dialects of the same language rather than separate languages. Especially is this true of the Old Bactrian (Avestan or Zend) division of Iranic (see AVESTA), the sacred literature of which extends back to about the seventh century B.C. Opposed to this division is the Old Persian (q.v.), sometimes called the Western dialect in antithesis to Avestan as the Eastern. Old Persian is the language of the cuneiform inscriptions of the Persian kings, and this alone survived as a spoken language, being gradually modified into Pahlavi (q.v.) and New Persian. Other Iranic dialects are Baluchi, Kurdish, and Ossetic (q.v.). See PERSIAN LANGUAGE.

Anatolic. This group comprises Armenian (which was formerly regarded as Iranic and is now sometimes accorded a separate division, see ARMENIAN LANGUAGE), Phrygian (q.v.), and Scythian, and until lately was supposed to be represented by Lycian (q.v.) and Carian also. Later investigations, however, have shown that the two latter do not belong to the Indo-European group, and Scythian applies only to such remnants of Indo-European origin as are represented by some of the names of nomads in southern Russia and on the border of Asia Minor. As such the division is maintained by Fick, but it rests on very doubtful evidence. The oldest literature is of the fourth century, unless the recently (1902) interpreted Arzawa language assigned to Cappadocia be regarded as Indo-European (c.1400 B.C.).

Hellenic. This comprises all the old Greek dialects, Ionic, Doric, etc.; Albanian (q.v.), a mixture of Greek and foreign elements; also the modern dialects of Greece. (See GREEK LANGUAGE.) The literature goes back to about 1000 B.C.

Italic. This division includes Latin, Umbrian, Oscan (q.v.), and other minor dialects; modern derivative dialects, in part primitive, in part due to foreign elements, Italian, Provençal, French, Spanish, Portuguese, Rumanian, etc., called in general Romance. The literature dates

from the third century B.C. (inscriptions still older). See ITALIC LANGUAGES; LATIN LANGUAGE; ROMANCE LANGUAGES.

Celtic. This group comprises (1) Cymric or Brythonic (Welsh, Breton, Cornish); (2) Gaelic (Irish, Manx, Gaelic—Scottish). The literature can be traced back to the eighth century A.D. See CELTIC LANGUAGES.

Teutonic. Originally Gothic (see GOTHIC LANGUAGE) and non-Gothic were the only divisions. These subsequently, on the basis of one euphonic change, were differentiated into Low and High German. The old divisions, still recognized by many scholars, are: (1) High German (Old, Middle, New); (2) Low German (Gothic, Saxon, Dutch, Frisian); (3) Scandinavian (Norse, Icelandic, Swedish, Danish). Gothic literature (translations of the New Testament) is of the fourth century A.D., but linguistic forms cited by Roman writers are earlier. See TEUTONIC LANGUAGES; GERMAN LANGUAGE.

Balto-Slavic (Slavonic). It is customary to unite these languages, which, however, stand as far apart as do Indo-Iranic. The Baltic (or Lettic) division, embracing the Old Prussian (q.v.), Lithuanian (q.v.), and Lettic (q.v.), the last-named spoken in Courland and Livonia, forms a unit over against the Slavic division (see SLAVIC LANGUAGES), which is divided into a large number of dialects incapable of being subdivided into different groups, though one division into Eastern, (South) Eastern, and Western and another into two subdivisions are sometimes made. But phonetics and morphology together prevent such classifications except as a matter of convenience, all the dialects being more or less related, but not in such a way as to show that any of them formed subgroups. A common and convenient geographical distribution is into the Western group, Polabian (formerly spoken in north Germany), Polish (q.v.), Sorbian (represented by the Wendish spoken in Lusatia), Czechish (spoken in Bohemia, Moravia, etc.), and the (South) Eastern group, Servian (see SERBO-CROATIAN), Slovenian, Bulgarian (q.v.), on the one hand and Russian (q.v.) on the other. Literary fragments go back to the eighth century. In the (narrower) Baltic division, however, a catechism of the sixteenth century represents the oldest known form of the dialect.

Inner Relation. Having thus sketched the geography of these parts of the Indo-European languages, we must next inquire whether any of these parts hold to each other especially close relations. Much that here seems obvious shows itself to be misleading. Thus, Latin is often regarded as standing in a peculiarly close relationship to Greek. In point of fact, however, while the Greek and Latin literatures are closely connected, there is no special kinship of the two languages. To detail all the groupings by subdivisions that have been urged by different scholars would take too much space, but the most practical historical differentiation is based on the varying treatment of the gutturals and vowels. In Hellenic, Italic, Celtic, and Teutonic, *k* and *q* represent the *ś* and *k* of the Eastern languages. The Sanskrit *tenuis* is preserved in the Western group, but the media and aspirate are modified to *j* and *h* (confused with the palatal evolution). The Western group had a pure *k* instead of the *ś* series, and *q* sounds (tending to become labials) instead of the *k* series. Examples of the *k* series are Hellenic *ἐ-κάρων*, Italic

centum, but Indic *śatam*; *ōxēs*, wagon, but Avestan *vasōiti*; of the *q* series, Italic *quod*, Indic *kad*. In vocalism the Eastern group has a simpler series than the Western. Now, between these extremes lies the Balto-Slavic (and in part the Anatolic) system, which agrees with the Eastern group in having the *ē* and *k* series (as against the *ē* and *q* series), but with the Western group in its more varied vocalism. There are no divisions of the languages which are of so marked a character as these of the *satam* and *centum* divisions. Latin stands near to Celtic in some forms (future and passive), but near to Sanskrit in others (e.g., the ablative). So in some aspects of morphology Balto-Slavic, Sanskrit, and Greek are akin, while in others they stand apart, and such resemblances and divergences are found among the other languages as well. What the inner relation may have been cannot be more nearly established by a comparison of forms, still less of vocabulary, and it seems safest to establish as subgroups only Eastern (Middle) and Western divisions. That Indic and Iranian lie so closely together may be due rather to their closer synchronism than to an originally greater similitude.

Before proceeding with the discussion of the inner relationship of these groups as shown by sounds, forms, and syntax, it is necessary to revert to the question of the primitive language, which, as was shown above, occupied so large a share of the attention of Schleicher. Since his day the problem has assumed a new form which may be studied under two aspects, geographical and dialectical. It was the opinion of the older Sanskritists that the earliest home of the Indo-Europeans was on the Pamir table-lands. Other sites have been assumed—the plains of Europe, Scandinavia, and many other centres. But on the basis of a comparison of the common vocabulary of all the languages and the state of culture represented by it, present opinion, induced largely by the results of Schrader's studies, inclines to the belief that the original home of the Indo-Europeans was on the plains north of the Carpathian Mountains. A very important contribution to the question was made by Schmidt, who tried to show that the duodecimal system of the Indo-Europeans was derived from Semitic sources. The discovery in 1902 of the Arzawa Letters (see above) would strengthen the belief in an early intercommunication between Indo-Europeans and Semites. These data, if accepted, would show that the Indo-Europeans at a very early period were near neighbors of the Semites and perhaps in close communication with them. Further, it is known that trade communication between the north of Europe and the southeast, possibly Semitic, took place at an early date, and, finally, it is scarcely to be doubted that Indo-European language and Indo-European race are not terms implying an identity of race and language. In short, language proves nothing with regard to race. This truth leads to a clearer insight in regard to the parent speech. Instead of imagining that there was a racial unity once marked by linguistic unity, we must inquire whether, in giving up racial unity as shown by language, we must not also renounce all attempts to establish a former linguistic unity. The answer will undoubtedly be an affirmative, and it is rendered more probable by all that we know of modern languages. The German dialects, e.g., show no trace of ever having been identical in form. Still more strik-

ing is the illustration given by Slavic as compared with Baltic. In a word, there was no parent speech of the Indo-Europeans, but there were always related dialects. (See DIALECT.) Thus the smallest dialect, geographically speaking, of Greece or Rome may preserve forms as ancient as any other. The idea of a language unity splitting up into dialects and these again into subdialects is probably a false conception. Codialectic forms is doubtless the only right expression. All efforts made to trace out a parent speech are based largely on doubtful data of the use of words regarded as original, although we do not know whether the words may not have been borrowed. All reconstructions of the parent speech, whether in the form of literature (such as Schleicher indulged in) or in the form of reconstructed hypothetical words, which are supposed to represent the sound of the primitive language and are constantly employed in our comparative grammars, are pure fictions of the imagination and are not to be regarded as representing an actual prehistoric condition of the language. We know the Indo-European languages only in dialectic form, as spoken by various races over a wide area. The dialects are divergences from each other, not, so far as we know, from any unitary parent speech. A universal parent speech is a historical possibility, but an Indo-European parent speech is merely a convenient hypothesis, which, however, leaves more to be explained than it explains, and may well be discarded, however pleasing it be to the mind that prefers unity.

Phonology. The regular interchange of certain sounds in the different languages of the Indo-European group was usually postulated at an early period, without the later insistence on the necessity of regularity. At first it seemed as if there were exceptions which could not be explained by any law. The sounds first compared were consonantal, as these seemed most regular. Their correspondence in certain of the Indo-European languages was formulated by what is known as Grimm's law (q.v.).

The vowel system took longer to explain and the consonantal system required modification. In the case of the vowels, apart from the determination of the long-disputed point whether the *a*, *e*, *o* of the Greek or their equivalents in one *a* sound, as in Sanskrit, represented the older state, the vowel system was seen to be more regular as soon as the primitive existence of sonant nasals and liquids was recognized. The chief modifications of Grimm's law, known as Verner's law (q.v.), and further contributory laws were established during the last quarter of the nineteenth century. At the same time was raised the question in regard to the original vowel form of roots and that of its changes in ablaut or modified vowels and diphthongs.

The priority of the Western *a*, *e*, *o*, as compared with the Asiatic monotone *a*, was proved by Amelung and Brugmann at about the same time (1876). Next was shown the existence of an Indo-European *e*, i.e., of a real palatal vowel, in Sanskrit itself. This was proved by Collitz and De Saussure, and independently by Verner, through demonstrating that when a Sanskrit *a* (= *e*) follows a guttural it palatalizes it and hence must itself be palatal. Thus, Sanskrit *as* = Gk. *es*, Lat. *que*. This discovery revealed at once that the vowel systems of Greek and Oscan were the faithful representatives of the Indo-European, the Indo-Iranian losing thereby

much of its preponderance. About the same time Ascoli discovered that there were two distinct series of gutturals in Indo-European. Osthoff (q.v.) and Brugmann, again, pointed out the existence in Greek of the Sanskrit *l* and *r* vowels, as shown, e.g., in *παρδοι* (= Sk. *pitrāu*), *ἔδρακεν*, etc., and that just as this *r* vowel contained heterogeneous elements, so there were an *m* and an *n* vowel in Indo-European, absolutely distinct from the consonants *m* and *n*. Then, as opposed to the view of the Hindu grammarians and early European scholars, it was shown by De Saussure in 1878 that in the series *i*, *e*, *ai*, the simple vowel is no more radical than is the *guṇa* form, *e*, *ai*, or, in other words, we cannot speak of the stem in *φέρω*, to take an analogous case, as being less original than that in *ἐφύρον*. This theory of vowel gradation led to the discovery of the existence of dissyllabic roots in Indo-European, thereby completely upsetting the old dogma of the monosyllabism of Indo-European roots.

In discussing consonantism the designations of other than the guttural series are self-explanatory, but in the guttural series there is great confusion of nomenclature. Thus, the Indo-European languages had palatal sounds, *a*, *j*; dentals, *t*, *d*; labials, *p*, *b*, both aspirated and nonaspirated. So they had aspirated and nonaspirated, surd and sonant gutturals, *k*, *g* (*kh*, *gh*). But these latter, being, as explained above, of twofold form, have different designations. There are two series, the palatal and nonpalatal guttural series. These are sometimes distinguished as palatal and velar, but the former is also called the *é* series and even the *k* series, while the latter is called the *q* series and also the *k* series. The velar *k* series was from the beginning distinguished from the palatal guttural by being a sort of back guttural, with a tendency to develop a half-vowel sound (*q^u* or *k^u*), which was lost in special languages. The two sounds either united or the guttural became more labialized (Skt. *ka*, Lat. *quo*, Goth. *hva*), a tendency that reached an extreme in Greek, where this guttural is often represented by a labial, as in *πo* (also before nasals and liquids), though sometimes dentalized, as in *πe* (before *i*, *e*), while sometimes coinciding with *k* (*κωs*). Besides gutturals and palatals, the Indo-European group possessed the consonantism just described, but it was defective in fricatives and spirants (e.g., *f*, Eng. *th*, *z*). Peculiar to the older language are the aspirated sonants retained in the Indo-Iranic group beside aspirated surds, as well as the modified nasals and sibilants, *n*, *s*, including *m*, the final half nasal, and final half sibilant. As already explained, Indo-European had as half vowels *y*, *v*, *l*, *r*. Lingual sounds (found in Sanskrit) appear to be borrowed from the Dravidians.

Before passing on to the subject of morphology it will be necessary to speak of one of the most important topics discussed, though not definitively settled, in the last few years. Verner showed that accent or stress influenced the character of consonants according to the accentuation of the syllable. The effect of stress, however, as already explained, is also patent as regards the vowel, which, as in *οἶδα*, *ἔδμεν* (originally *ἔδμεi*), shifts with the accent. But of late it has been shown that another very important law of accentuation has been at work in determining the form of stems. Fick and Möller have emphasized the importance of pitch, i.e.,

musical accent, as contrasted with stress accent. They show that there is a certain relation between the palatal vowel and a high pitch; and a guttural vowel and a low pitch, a relation explicable on physiological grounds; the action of the vocal organs naturally associating the high pitch with the palatal *e* and the low pitch with the guttural *o*. Thus, there is a natural connection between the accent or nonaccent and the form of the two vowels in *λέγω*, the *e* vowel having the high pitch, the *o* vowel having the low pitch. This matter has not yet been thoroughly investigated, and there are many phenomena not yet explained by it. For example, in *λόγος* the low pitch has the stress. But at all events, accent is evidently a factor which will, when properly understood, explain much in stem formation.

Morphology. This studies change of form and the cause of change. The chief factors tending to change the form of words are phonetic degeneration, as it used to be called, or phonetic variation and growth, due partly to individual peculiarities, but more to the attrition of speech, force of expression, the law of least resistance, and the interaction of the individual and his environment. Change of stress and change of pitch and the substitution of stressed accent for pitch affect the form as well as the accent of words. Analogy (q.v.), especially false analogy, causes changes, in the endings particularly, and the growth or change of function in one class of words is liable seriously to affect the form and even the existence of words of another class. Imitation, due to association, may be conscious or unconscious. Complete changes in the pronunciation of a vowel may occur over a wide area in a short time and then remain or as suddenly disappear. Most of these changes of form are the result of a long series of gradual minute alterations, intervening in time, both in phonetics and in morphology. Difference of meaning may be mentioned last as having had effect on form, a factor more or less connected with accent. Apart from these questions of the philosophy of change, morphology has to do with the forms as presented in language, which may most conveniently be discussed under the head of roots (see Root), stems, the forms of nouns, and the forms of verbs.

In regard to the stem complex of root and ending, apart from a vague theory of Westphal that near and distant sounds have something to do with stem formation, only one theory has been opposed to Bopp's agglutination theory. This is a profound study by Ludwig, marred only by the assumption of absolute lawlessness in phonetics. The points made are that the endings serve different purposes, a first person serves as third, a locative as a genitive, etc., and the farther back we go the looser is the language. Ludwig substitutes for agglutination, therefore, the theory of adaptation. Verbal endings are not from pronouns; no personal endings existed; before the verb was the indefinite infinitive used for any person, any tense, and both imperative or indicative in meaning; suffixes acquired definite implication by a gradual adaptation of special meanings, having originally only a demonstrative sense. While containing much truth, this adaptation theory is too exaggerated to be acceptable as a working hypothesis. Another theory, that of Scherer, regards endings of stems of verbs and nouns as indicating a locative sense, while Benfey traced all endings from

verbal termination *anti* (believing that nouns are from verbs); but the last two views are too fantastic to be discussed.

Forms of Nouns. The same word is noun and verb in its most primitive form, as Sanskrit *dāti*, a giving, or he gives. Nouns had seven cases, perhaps more, in Indo-European. The same case had different endings, but, on the other hand, it is most likely, despite the fact that this seems to point to other cases, that, had such cases existed, some traces would have been preserved. Different endings may gradually have become restricted in application, and, as in the case of the Greek dative, different functions may have been absorbed by one ending, tending to a loss of another ending. The seven cases have endings more or less uniform, but, apart from modifications caused by the form of the stem, some cases are compounds of two case endings and some cases show different forms according as a word is declined as noun or pronoun. The seven cases are nominative, accusative, instrumental, dative, genitive, ablative, locative. They are found in the singular, dual, and plural, but except for the nominative and accusative dual in *du* (*dv-āu*, *duo*) the dual endings are not identical in the different languages and are omitted here. The vocative is not a case, but the bare stem in weak form. An apparent ending in the *o* stems is only a vowel weakening. The chief endings are:

Nom. sing., *s*, *m*; pl., *os* (*es*), (*o*)*i*, [*ā*].

Acc. sing., *m*, *d*; pl., *ma*, *ā*.

Instr. sing., *e*, *a*, *bhi* (*mi*), *na*; pl., *bhis*, *o-i-s*.

Dat. sing., (*ai*), *e*, *bhya* (*m*); pl., *bhyas*.

Gen. sing., (*o*)*s*, *sia*; pl., *om* (*ām*), *sām*.

Abl. sing., [*os*], (*a*)*t*; pl., *bhyas*.

Loc. sing., *i*; pl., *su* (*si*).

The ablative is lacking in the singular, except in a few nouns and pronouns, and in the plural, borrowing the forms of the genitive singular and dative plural. The plural *os* (*as*) is the noun ending in Sanskrit; *ai* (*oi*) the pronoun ending in Sanskrit and Oscan, and the noun ending in Slavic, Greek, Latin, Celtic, and Gothic. Both *i* and *s* serve as plural signs, the latter being added to the nominative, accusative, instrumental, and dative. Some endings were independent words, e.g., *i*, *u*, *a*, *āt*, and Sanskrit still has cases made by adding *ā* to *ē*. Adjectives have noun endings (with some restrictions). The comparative *tara* means farther (also *has*, *hos*). The superlative, *tata*, *tama*, and *ishta*, is not clear. Numerals have essentially the same form in Indo-European, *ai-ka* (*oinas*), *dya*, or *statam-centum*, up to *χίλιοι* = (*sa*)*hasra*, though the latter identification is very doubtful, and in any case may mean heap, or large number, rather than a definite thousand. The duodecimal system is clearly marked in Sanskrit higher numbers alongside of the decimal system. (See above.) Participles are part of the noun system and the stems end in *ta*, *na*, *m(a)na* in Sanskrit, Avestan, Greek, and Latin. Prepositions (adverbs) may have case endings, e.g., *παρά*-*i*, *παρά*, *πρόσω*.

Forms of Verbs. The Indo-European languages had four tenses, present (imperfect), aorist, perfect, future, and four modes, indicative, subjunctive, optative, and imperative. Only the first three tenses are pure, the future being modal (will), and consequently is found only in the indicative, with rare (Vedic) and late (Greek) exceptions. There are two voices, active and middle, the latter serving originally as

a passive as well. Secondary conjugations of the prothetic period are numerous. The most clearly defined are causative, denominative, intensive, desiderative, and inchoative. Sanskrit further invented a passive class, and Latin and Celtic had a special passive voice, while Greek and Sanskrit converted certain aorist forms into passives. There are three numbers, but the dual is weak and even in the oldest Vedic and Greek interchanges with the plural, being lost in Celtic and Latin (save for the ending *-tie*), though preserved in Gothic and Balto-Slavic. Verbal endings are primary and secondary (present and preterit); special endings occur in the perfect. Omitting the dual, these endings in Sanskrit, which has preserved them most fully, are in the active singular, 1, *mi*, *a*; 2, *si*, *tha*; 3, *ti*, *a*; plural, 1, *ma*, *ma*; 2, *tha*, *a*; 3, *a(n)ti*, *us*; while the middle changes *i* to *ē*, and *ma*, *tha* to *mahē*, *dhvē*, and the preterit tenses drop the final vowel and have *mahi*, *dhvam* for *mahē*, *dhvē*. The preterits and the perfect have also certain *r* forms, *ram*, *rē*, etc., like the Latin passive. The present stem is divided into many classes, of which 10 are recognized by native Sanskrit grammarians. Including secondary conjugations, the Indo-European languages had in all 32 ways of varying the stem by infixes, suffixes, and changing the vowel of the root. Many of these verbal stems coincide with nominal stems. They appear originally to have indicated modified forms of action. The aorist stem is formed either by reduplication, like the perfect, or by inserting an *s* element, like the future, or it may be differentiated from the present class merely by the vowel or by an ending (*βῆ*, *βάσκω*). The future has primary endings, but in Sanskrit may be augmented with preterit endings, making a conditional. The subjunctive and optative have different formative elements and their endings are originally the primary and secondary, respectively (see below), while the imperative has preterit endings modified, or special forms. It has no modal sign. In some classes of verbs the subjunctive form coincides with the indicative. Hence *ā*, the subjunctive modal sign, Greek *η*, is not locative, as Scherer taught, but probably due to analogy. The optative sign is *ja* when accented, *i* when unaccented, as shown by J. Schmidt; whence *i* is probably a reduction from *ja* (cf. *yā*, *go*, though this derivation is not favored by Schmidt).

As to the personal endings, with the exception of the third plural (and the dual), Delbrück (q.v.) thinks they are connected with the personal pronouns, but, if so, they must go back to a period when they were more deictic than pronominal. The singular affixes *mi*, *si*, *ti* have been explained (not very convincingly) both as taken from the pronouns and as having originated the pronouns; but the plural *anti* is probably connected with the participle, the *i* being explained by Ascoli and Brugmann as due to analogy with *ti* (a locative in Scherer's opinion). This finite verbal form would then be analogous to *amamini* (also a participle). The middle endings have been explained as strengthened forms. In Sanskrit the only original strongest form is *āi* (*ēi* and *tāi* being later), a still stronger form of *ē*, which lends color to this (still doubtful) suggestion. Verbal stems were originally not connected with prepositions (most of which are adverbs); hence Latin compound verbs are later than Greek and Sanskrit, and tmesis in the lat-

ter is really the older form. New forms have been developed in the separate languages, e.g., aorist passives, the future optative and future infinitive in Greek; a third singular preterit aorist passive and a complete *ya* passive in Sanskrit; *r* passive and *bo* future in Latin and Celtic. Greek, like Sanskrit, is older than Latin in having fuller endings, a middle voice, and an augment. The other Indo-European languages have later verbal forms. The augment may have had a short and a long form, *e*, *η*, and survived in Sanskrit, Persian, and Greek, with traces in Avestan.

Syntax. Only the chief points can be noticed here. First, as to the syntax of nouns: The old distinction between grammatical and nongrammatical cases cannot be maintained. The nominative designates the active, the accusative the passive relation. The latter is both an object of a verb and an object of thought. With space and time the accusative is still a veiled object case. The instrumental shows accompaniment, means, limit; the dative, "to" or "for"; the genitive, any adjectival relation, "of," "belonging to"; the ablative, source and means, "from," "by"; the locative, place or time, "in," "at," "within." The syntactical method of Delbrück assigns to each case a certain narrow function, as either "in" or "within" (but not both) to the original locative; "to" or "for" (but not both) to the dative; etc. But each (pure) case originally contained in itself all that is ascribed to it; the dative from the beginning was a "to" and a "for" case; the locative expressed both "at," "in," and "within." The instrumental survives in adverbial form in Greek, but the Greek dative singular is a locative. The genitive in *sta* is an adjective stem like that of the pronouns, *asmāka* (*m*), *nostrum*, *nostrī*, which explains in part the syntax of the case. So the Latin *i* genitive may be adjectival (preserved in other Italic dialects instead of changing to *oi* or *ei*, which would be the locative form). Other genitive syntax is explained as being due to a sort of adjective-compound effect, in that the sign *as* (*os*) is probably only a nominative affected by sentence accent. So *s* is the sign of the nominative as well as of the genitive. The ablative was probably confined at first to the singular pronoun, where it seems to be from an adverbial affix. Such syntactical growths are common, prepositions (adverbs) being affixed also to completed endings to emphasize the meaning, as *m* is added to the Italic locative, *ā* to the Avestan locative, or *i* to the Latin feminine nominative, *quā-i* (*quā*). In the last-named case the meaning is probably only emphatic, just as in English *yes-sir-ee*. The nominative *s* has been associated with the demonstrative pronoun. The *m* of the accusative is identical with the *m* of *aham*, *idam*, *ēgōn*, *idem*, though what shade of meaning it may have had is as impossible to explain as is the pseudo ending of the German *mi-ōh*. The neuter nominative in *m* has been explained as borrowed from the nominative, on the ground that neuters were originally not subjects of verbs; but this is improbable.

In verbs present-tense stem connotes durative time; the aorist, unrestricted time, either inchoative or resultant; the perfect, repeated present (inchoative or intensive); the future, modally affected future (will). The subjunctive gives the idea of the unrestricted indicative with the addition of a shall or will element

(time and mode); the optative expresses "should" or "might"; the imperative, a command. The aorist may be present or preterit in time, and differs from the present-stem meaning only in its quality, since it does not express continued or durative time. Thus, Sanskrit *gacchati*, present, is "he continues agoing," but *gāti*, aorist, is "he goes." The present may thus do duty for a future, as in Gothic. The verbal stem being coincident with the noun stem, the sense of *bharati* is really "a bearing, that," or "he is abearing," rather than "is a bearer." The reduplication of the perfect connects it with the reduplicated present, desiderative, and intensive forms, and in its first application it connotes present time, afterward extended to past time, perhaps helped thereto by the pluperfect (with augment), which in Sanskrit is not so much a pluperfect as a reduplicated aorist. The tense of narrative was originally the imperfect, not the aorist. The syntax of the Greek aorist is complicated by the confusion of aorist and imperfect forms. In Sanskrit future (will and pure future) and optative complement each other and eventually suppress the subjunctive altogether.

The subjunctive, as already stated, has originally primary, the optative secondary, endings; but in Sanskrit the former has taken some secondary endings and in Greek the latter some primary endings. These endings are significant. The optative goes with the imperative and injunctive, modes of wish and command; the subjunctive with the future, "shall" and "may." Delbrück believes that the subjunctive originally expressed will, the optative wish. But his categorical system of syntax is unable to explain the potential sense of the optative and the future sense of the subjunctive. The subjunctive originally connoted a vague shall-will, at the pleasure of the speaker. The primitive subjunctives, *ἔδομαι*, *ero*, are, in fact, simple futures. So the optative expressed both should and might. In Latin the subjunctive is partly optative. The Homeric subjunctive is later limited to half of its functions. Sanskrit has a distinct precative optative to express wish. Here, as elsewhere in grammar, linguistic machinery of a rough sort was slowly adapted to growing needs, and many shades of meaning were expressed under one form. Vulgar English shows continually how men without discrimination get along very comfortably with the same tense and mode and ending for many situations. In regard to the imperative, which has secondary endings, it was originally used only in the present and for commands, not for prohibitions. Hence, *μή* is used with the subjunctive aorist, and later with the present imperative only as an extension. So a subordinate negative clause takes *μή*, as *ὅς μή ἔλθῃ* (shall not come). Thence the use was extended (*εἰ μή* with indicative). Some scholars assert that the optative was originally potential, for the pure optative is used with *οὐ*, not with *μή* (for wish). It is worth noticing, in connection with the Greek secondary endings, that when used without augment they may always indicate a command, as in the Sanskrit injunctive, which is an unaugmented preterit.

The determination of the meaning of cases, of tenses, and of moods does not exhaust the store of syntactical problems upon which light has been thrown by comparative philology; but these are the most important aspects and they

show sufficiently what has been accomplished. The discovery of new cases (instrumental and locative) in Sanskrit, not recognized in the classical languages, laid the basis for a thorough treatment of case relations, as the discovery of the injunctive and the Vedic values of subjunctive, optative, aorist, and perfect first clarified the problems connected with the verb.

Modern Tendencies. A typical example of the relation between the stages of growth in the study of philology is given by etymology (q.v.). Before Pott there was an utter want of scientific method. Pott opposed this looseness. Curtius again opposed Pott for 30 years on the ground that Pott was not strict enough. The young grammarians in their turn attacked Curtius because he refused to admit that phonetic law is irrefragable.

More recent studies have made etymology much stricter still. To cite a famous example, of all the parallels in the names of Greek and Hindu gods utilized by Müller in his mythological studies, only one case, Dyaus-Zeus, is now regarded as certain. On the other hand, in regard to the constancy of phonetic law, the modern tendency has been to claim that the new school went too far. Bechtel, in 1892, and since then other scholars have questioned the validity of the shibboleth of changeless law. Other doubts have risen in the last decade on other fields. Stress accent has been replaced in part by musical accent in importance. Schmidt's wave theory has been modified. Semitic influence, as shown in numbers, has been replaced by a putative Dravidian influence, but this matter is unsettled. In geography Lycian and Carian have been definitively removed from the field of the Indo-European languages. The importance and antiquity of Pali (q.v.) has been brought to the fore. The possibility of reconstructing a parent language has been rendered quite doubtful. Syntax, the need of which was first shown by Bréal, has virtually been built up by one great German scholar, Delbrück. It was the latest task of philology. Naturally the principles thus swiftly built into a system by one man are open to revision. Signs are apparent that the categorical method hitherto employed has ceased to be useful in helping to discover the genesis of syntactical change. Delbrück himself has admitted that his results are founded chiefly on subjective impression. Other scholars question, not the value of the facts amassed by Delbrück, but their interpretation, in criticism that began with Whitney and has tacitly been accepted by Brugmann, Speyer, and other interpreters of syntactical data. In like manner the motive of phonetic change as explained by Delbrück has been attacked by Wundt, Meyer, and Oertel, who have respectively sought to show that phonetic change depends largely on ease (or speed), strength of expiration, and geographical environment.

But besides laying stress on new points of view of minor importance, such as haplography, philology has recently brought to the fore one principle and elevated it into the dignity of a new branch of the study under the name of semantics, or semasiology (q.v.). In 1897 Bréal published his *Essai de sémantique*, which organized into a systematic whole, under different categories, transfers of meaning in the evolution of words. Contiguity, resemblance, and contrast were shown to cause changes of meaning. Our word "pike" for "road," e.g., arose from "turn-

pike road," with a gradual reduction of the phrase to its most characteristic element (the pike or pole which turned the stile at a tollgate) to represent the whole.

For the past 20 years, then, it has seemed that the study of philology has reached its limits. Newly discovered texts, such as that of Manichean Pahlavi, Sogdian, Eastern Iranian, or even of the loudly hailed Tokharian, add only details or confirmations—both valuable, however—to the already established theories. A language more ancient than Vedic or Greek and of equal importance would be necessary to change the conception of Indo-European. Many are even inclined to believe that very important results may come from a satisfactory comparison of the Hamitico-Semitic or Ural-Altaic to Indo-European. However that may be, since 1900 philologists have devoted their most active attention to the study of dialects. This work has been initiated in a most brilliant manner by Gilliéron and Edmont, whose *Atlas linguistique des parlers français*, in 1915 being finished, has shown that the influence of central dialects, and especially of common languages, is immense. Considerable help may be expected also from the study of experimental phonetics (q.v.), developed especially by Rosapelly, Roussetot (q.v.), Scripture, and others, through which a more rigorous interpretation of linguistic facts becomes possible. And since Wundt applied psychological results to linguistics numerous efforts have been made, the most noteworthy of which is that of Ginneken, towards a closer *rapprochement* with this science.

In 1915 it seemed that the study of philology was undergoing a process of transformation. There was a decided reaction against *Sprachmischung*, or the mutual penetration of two dialects, the method postulated about 20 years ago by the German school under the leadership of Schuchardt (q.v.). This scholar believed that by this method one could arrive at general laws applicable to all possible cases. The great defect of this system was that it failed to take into consideration numerous historical factors as well as variable accessory circumstances. The new French school, with Meillet (q.v.) at its head, rejects entirely the esoteric philology which isolates linguistic facts from all contact with life, and attempts to interpret linguistics by the social movements of civilization—in brief, to recognize in the development of languages the result of political and social actions. Such a doctrine necessarily implies the subordination of theory to fact and the restoration of the written language to its former place of supreme importance.

Bibliography. Berthold Delbrück, *Syntaktische Forschungen* (Halle, 1871-88); W. D. Whitney, *Life and Growth of Language*, in "International Scientific Series," vol. xvi (New York, 1882); Georg Curtius, *Zur Kritik der neuesten Sprachforschung* (Leipzig, 1885); Brugmann and Osthoff, *Morphologische Untersuchungen* (ih., 1890); August Fick, *Vergleichendes Wörterbuch der indogermanischen Sprachen* (4th ed., Göttingen, 1890-94); Max Müller, *Lectures on the Science of Language* (rev. ed., New York, 1891); H. A. Strong and others, *Introduction to the Study of the History of Language* (London, 1891); Brugmann and Delbrück, *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen* (2d ed., 3 vols., Strassburg, 1897-1913); Eduard Wechs-

slers, *Giebt es Lautgesetze?* (Halle, 1900); Schmalz, "Lateinische Syntax," in Müller, *Handbuch der klassischen Altertums-Wissenschaft* (3d ed., Munich, 1900); W. M. Wundt, *Sprachgeschichte und Sprachpsychologie* (Leipzig, 1901); Peter Giles, *Short Manual of Comparative Philology* (New York, 1901); Greenough and Kittredge, *Words and their Ways in English Speech* (ib., 1901); Hans Oertel, *Lectures on the Study of Language* (ib., 1901); L. H. Gray, *Indo-Iranian phonology* (ib., 1902); Jürgen Knudtzon, *Die zwei Arzawa-Briefe* (Leipzig, 1902); Berthold Delbrück, *Das Wesen der Lautgesetze* (ib., 1902); Franke, *Pali und Sanskrit* (Strassburg, 1902); Henry, *Précis de grammaire palie* (Paris, 1904); W. W. Skeat, *Primer of Classical and English Philology* (Oxford, 1905); Fritz Mauthner, *Die Sprache* (Frankfurt, 1906); J. M. Edmonds, *Introduction to Comparative Philology for Classical Students* (New York, 1906); Otto Schrader, *Sprachvergleichung und Urgeschichte: linguistisch-historische Beiträge zur Erforschung des indogermanischen Altertums* (3d ed., 3 vols., Jena, 1906-07); Fritz Mauthner, *Beiträge zur einer Kritik der Sprache* (2d ed., 3 vols., Stuttgart, 1906-13); Donald MacDonald, *Oceanic Languages: Their Grammatical Structure, Vocabulary, and Origin* (Oxford, 1907); Jean van Ginneken, *Principes de linguistique phonétique* (Paris, 1907); T. J. Tucker, *Introduction to the Natural History of Language* (London, 1908); Berthold Delbrück, *Einleitung in das Studium der indogermanischen Sprachen* (5th ed., Leipzig, 1908; Eng. trans. of 1st ed., by E. Channing, ib., 1882); Wilhelm Meyer-Lübke, *Einführung in das Studium der romanischen Sprachwissenschaft* (Halle, 1909); Hermann Paul, *Prinzipien der Sprachgeschichte* (4th ed., Halle, 1909); F. N. Finck, *Die Sprachstämme des Erdkreises* (Leipzig, 1909); H. Pedersen, *Vergleichende Grammatik der keltischen Sprachen* (2 vols., Göttingen, 1909-13); W. D. Whitney, *Language and the Study of Language* (7th ed., New York, 1910); Vatroslav Jagić, *Geschichte der slavischen Philologie* (Berlin, 1910); F. N. Finck, *Die Hauttypen des Sprachbaues* (Leipzig, 1910); W. M. Wundt, *Völkerpsychologie* (3d ed., ib., 1911); J. L. Hoops, *Reallexikon der germanischen Altertumskunde* (Strassburg, 1911-13); W. W. Skeat, *Science of Etymology* (Oxford, 1912); W. M. Wundt, *Elemente der Völkerpsychologie* (Leipzig, 1912); F. K. Brugmann, *Lehre von dem Wortformen und ihrem Gebrauch* (3d ed., Strassburg, 1913); M. J. A. Bréal, *Essai de Sémantique* (5th ed., Paris, 1913; Eng. trans. of 1st ed., New York, 1900); Otto Jespersen, *Lehrbuch der Phonetik* (2d ed., Leipzig, 1913); Pekmezi, *Lehr- und Lesebuch des Albanischen* (Vienna, 1913); Alexander Green, *Dative of Agency: A Chapter of Indo-European Case-Syntax* (New York, 1913); Antoine Meillet, *Aperçu d'une histoire de la langue grecque* (Paris, 1913); id., *Introduction à l'étude des langues indo-européennes* (3d ed., ib., 1913); id., *Altarmenisches Elementarbuch* (Heidelberg, 1913); Sigmund Feist, *Kultur, Ausbreitung und Herkunft der Indogermanen* (Berlin, 1913); id., *Indogermanen und Germanen* (Halle, 1914); Raoul de la Grasserie, *Du verbe comme générateur des autres parties du discours* (Paris, 1914); Hermann Hirt, *Fragen des Vokalismus und der Stammbildung im Indogermanischen* (Strassburg, 1914); Hagen, *Die Indogermanen* (Gütersloh, 1914);

Leonard Bloomfield, *Introduction to the Study of Language* (New York, 1914); Renward Brandstetter, *Indonesisch und Indogermanisch in den Lautgesetzen* (Lucerne, 1915).

PHILOLOGY, CLASSICAL. See GREEK LANGUAGE; ITALIC LANGUAGES.

PHILOMEL (Lat. *philomela*, from Gk. φιλομήλα, nightingale, from φιλεῖν, *philein*, to love + μέλος, *melos*, melody). A nightingale, especially the Persian. See NIGHTINGALE.

PHILOMELA (Lat., from Gk. Φιλομήλη). In the Greek mythology, a daughter of Pandion, King of Athens, and sister of Procne. In reward for assistance rendered, Pandion gave Procne as wife to Tereus, King of Thrace, who became, by her, father of Itys. He then dishonored Philomela, pretending that Procne was dead, and to prevent her from telling her wrongs cut out her tongue. Philomela, however, by weaving words in a robe, revealed the truth to Procne, who, to punish her husband, killed her son and served him up to Tereus. The sisters then fled, but, being pursued by Tereus, were changed into swallows or nightingales, while Tereus became a hoopoe or hawk.

PHILOMELA, THE LADY FITZWATERS' NIGHTINGALE. A romance by Robert Greene (1592). It is founded on an Italian story of jealousy, perhaps that of *Tito and Gisippo* in the *Decameron*.

PHILOPOEMEN (Lat., from Gk. Φιλοπομπήν, *Philopomēnē*) (252-183 B.C.). The most illustrious statesman and general of Greece in the period of her decline, the great object of whose life was to establish the independence of his country on a firm and lasting basis. He was born at Megalopolis in Arcadia, of a noble family. At an early age he lost his father and was brought up by a wealthy citizen of Mantinea named Cleander, who secured for him a careful education. He received instruction from the academic philosopher Ecdemus and Demophanes, ardent champions of freedom. His first experience in warfare was gained in the border raids that took place between the Arcadians and the Laconians, and in 222 B.C. he with a few others defended Megalopolis against the attack of the Spartan King, Cleomenes. In the following year, when the Macedonian King Antigonus came to the assistance of the Achæans, Philopœmen joined him at the head of a band of horse and distinguished himself in the battle of Sellasia (221 B.C.), in which the power of Sparta was completely broken. Philopœmen then went to Crete, where he lived 11 years; on his return in 210 he became commander of the Achæan horse, and in the expedition of 209 against Elis distinguished himself for his bravery, slaying with his own hand the Elean leader, Demophantus. In 208 he was chosen strategus or commander in chief of the Achæan league, a place that he held eight times. He proceeded at once to introduce reforms in the discipline and equipment of the soldiers and soon, by these means and by his personal influence, made the army a most effective instrument of war. In 207 he defeated the Spartans under Machanidas, and at the Nemean festival that followed the people proclaimed him liberator of Greece. In 201 he defeated Nabis, who had succeeded Machanidas as tyrant of Sparta. Soon afterward he made another voyage to Crete. Returning to the Peloponnesus in 194, he was appointed strategus in 192 and again defeated Nabis. Shortly after

this time he compelled Sparta to enter the Achaean League (see *ACHÆA*), and when she revolted, in 188, he took the town, razed the walls, and compelled her to adopt the Achaean laws. He was in his seventieth year and ill in bed when news was brought him that the Messenians had revolted from the League; he immediately rose and took command of the army. In the battle that ensued he was taken prisoner, and Deinocrates, the Messenian commander, sent him a cup of poisoned wine, which he drank. Consult: Plutarch's *Life of Philopœmen* (rev. ed., by A. H. Clough, in Everyman's Library, New York, 1910); also, E. A. Freeman, *History of Federal Government in Greece and Italy* (2d ed., ib., 1893); J. P. Mahaffy, *Alexander's Empire* (ib., 1898); R. Pöhlmann, *Grundriss der griechischen Geschichte* (5th ed., Munich, 1914).

PHILOSOPHER OF FERNEY. A title given to Voltaire, from the name of his residence in Switzerland, near Geneva.

PHILOSOPHER OF MALMESBURY. A title conferred on Thomas Hobbes, from the name of his birthplace.

PHILOSOPHER OF SANS-SOUCI, sän-sō'sé'. A title applied to Frederick the Great, from the name of his palace at Potsdam.

PHILOSOPHER OF WIMBLEDON. A name used of John Horne Tooke, from his residence in Surrey.

PHILOSOPHER'S STONE, THE. A mysterious compound to which was attributed the power of transmuting metals into gold or silver, the attempted making of which was the chief occupation of alchemists, at least during the Middle Ages. In reality it bore no resemblance to a stone. It was a panacea for human ills that was so eagerly sought, for, with the function of a universal solvent, it combined that of the elixir of life, a renewing influence on the body. The conception of the transmutation of metals was Oriental. The Arabs regarded metals as compounded of mercury and sulphur in varying proportions. To this was added a more philosophic conception of a common basis of all forms of matter, the "materia prima" of which Plato had written. Three forms of the philosopher's stone are mentioned—a red tincture transmuting metals into gold; the elixir vitæ, restoring youth and prolonging life; and a white tincture, changing metals into silver. Geber (q.v.) was the reputed author of the *Key of Wisdom*, a secret book on the philosopher's stone. The matter was generally shrouded in mystery, but Van Helmont asserted that he had seen and handled the stone, which was sulphur color, heavy, and brilliant as glass; Paracelsus described it as a solid, deep ruby in color, transparent, flexible, and as brittle as glass; Raymond Lully, again, described it as a carbuncle. After the thirteenth century a mystic and esoteric interpretation of the philosopher's stone seems to have been applied to morals, it bringing the wearer wisdom and virtue, and purifying the soul. Consult Carl Engler, *Der Stein der Weisen* (Karlsruhe, 1889), and Giano Lacinio, *The New Pearl of Great Price* (Eng. trans., London, 1894). See *ALCHEMY*.

PHILOSOPHICAL SOCIETY, AMERICAN. The oldest of American learned societies. Its official name is the American Philosophical Society Held at Philadelphia for Promoting Useful Knowledge. Its hall is No. 104 South Fifth Street, Philadelphia, in which are an

extensive and valuable library, many interesting portraits and busts, and a collection of relics, including the chair used by Jefferson while writing the Declaration of Independence. The society originated in 1727, as a club for mental improvement, in which Franklin formed most of his ingenious acquaintance, as he tells us in his Autobiography. On May 14, 1743, Benjamin Franklin conceived an idea of forming a society which should include members from all the Colonies, and to this end he published in Philadelphia *A Proposal for Promoting Useful Knowledge among the British Plantations in America*, and, though his suggestions were not acted upon immediately, he wrote, on April 5, 1744, that the society had been formed and held several meetings, with Thomas Hopkinson as president and himself as secretary. Within a few years regular meetings were discontinued from time to time until April 25, 1766, when it was reorganized as a society, and its name was changed to the American Society for Promoting Useful Knowledge. The American Philosophical Society renewed its activity in November, 1767, and the union of the two, being located in the same city and having the same objects, was suggested; but a year was spent in negotiation before the two became one on Jan. 2, 1769, adopting the present name and electing Benjamin Franklin president. The second president was David Rittenhouse, and he was succeeded by Thomas Jefferson. In 1785 John Hyacinthe de Magellan, of London, presented 200 guineas to the society for a perpetual fund, the interest each year to be put into a gold medal, to be given to the author of the best discovery or improvement in navigation, natural history, or astronomy. The Magellanic fund has always been kept as a separate investment, and its medal is considered a great honor in the scientific world. Membership in the society is limited to the election of 15 residents in any one year of the United States and of three foreign residents, and the honor of an election to membership is highly prized by American scientists. The society holds in April of every year a general meeting to which distinguished men of Europe are invited, and these assemblages are events of international interest. The published *Transactions* of the society begin in 1771, in which year a copy was given to each member of the General Assembly of Pennsylvania, with the statement that "the volume is wholly American in composition, printing, and paper." The society publishes also its *Proceedings*, beginning with the year 1838.

PHILOSOPHY (Lat. *philosophia*, from Gk. *philosophía*, love of knowledge, from *φιλεῖν*, *philein*, to love + *σοφία*, *sophia*, wisdom, from *σοφός*, *sophos*, wise). A term used originally, e.g., by Socrates, to mean devotion to the pursuit of truth. In Plato it came to mean knowledge of eternal reality. Aristotle employed the term sometimes as equivalent to critical systematized knowledge, sometimes as meaning the science of ultimate reality. The Stoics considered philosophy to be endeavor to obtain excellence (*ἀρετή*, *aretê*) in knowledge and in morality; the Epicureans regarded the philosopher as the man who pursued happiness in the manner suggested by reason. In the Middle Ages philosophy came to be ancillary to theology and in large measure the reasoned defense of divinely revealed truth. In modern times various definitions have been given, such as "rational knowl-

edge derived from concepts as such" (Kant), "the revision of the concepts" (Herbart), "the science of principles" (Ueberweg), "knowledge of the highest degree of generality" and "completely unified knowledge" (Spencer), "the totality (*Inbegriff*) of all scientific knowledge" (Paulsen), "the reduction of the general knowledge obtained by the special sciences to a complete system" (Wundt), and "man thinking, thinking about generalities rather than about particulars" (James); while some thinkers have despaired of the possibility of finding any definition that shall cover the whole field historically occupied by philosophical speculation. The conception of the task of philosophy necessarily changes with the course of time. At the beginning, before any special sciences had arisen, it was natural that the unity of knowledge should be insisted on and that the student should ambitiously take all knowledge for his province. But the scope of philosophy has gradually grown narrower as its original domain has been encroached upon by new sciences. The failure of philosophers of the present to agree on the definition of their work may be ascribed to the fact that so much territory has been already occupied by these sciences as to leave the proper domain of philosophy in doubt. These sciences have one and all been experimental in their method. To those who believe in the existence of a priori knowledge, a point of departure for delimiting philosophy from science is obtained in this distinction of the inductive from the deductive. But the belief in a priori knowledge is less current than it was a hundred years ago, and some other differentiation of philosophy from science must be undertaken by the inductivist. Perhaps no better plan can be adopted than that based upon the specialistic character of present-day science. Each science pursues its own investigations in its own limited field and will allow itself to be prejudiced as little as possible by what is done in other fields. But, after all, it is the same universe that furnishes object matter to all the separate sciences, and one would naturally expect that all the separate knowledges gained by specialists would articulate themselves into a coherent system of knowledge. The hope to accomplish this articulation in detail would be idle; but every science has its concepts, which it uses to organize the facts in its own little field. Do all the concepts tally? Are they compatible with one another? Questions of this sort are reasonable, and an attempt to answer them forms the so-called philosophy of nature, which may be defined as the correlation and criticism of scientific concepts. Among such concepts are those of matter, energy and its conservation, atom, ion, electron, life, evolution, differential, point, line, etc. The philosophy of nature is without doubt the most difficult branch of philosophy, as it demands for its prosecution considerable familiarity with the leading sciences. But while it is not to be hoped that any very brief and general treatment of the subject can be satisfactory, still more detailed work in the way of correlation and criticism of the conceptions employed in a few sciences can be reasonably expected. Such work has been done in English by J. B. Stallo in his *Concepts and Theories of Modern Physics* (London, 1882; new ed., New York, 1897), and by James Ward in his *Naturalism and Agnosticism* (London, 1899; new ed., 2 vols., New York, 1903).

Again, all the sciences take for granted that man can know something about the universe. What is this knowledge? Is it really valid, as it asserts? Is there any way of ascertaining its validity? A scientific treatment of these questions is called epistemology, or the theory of knowledge (q.v.), and it forms a second philosophical discipline. (See KNOWLEDGE, THEORY OF.) Still again, can any light be thrown on the ultimate nature of the reality either of the external world or of the mind? This is the problem of metaphysics (q.v.). Formerly logic, psychology, and ethics were considered as branches of philosophy, but the modern tendency is to establish them as separate sciences. This is accomplished, however, only in a restricted sense. At bottom the question whether this or that discipline is a science or a branch of philosophy is of no great importance, when it is recognized that there is no fundamental difference in method between science and philosophy, the only difference being one of degree, not of kind. The more abstract any systematic knowledge is, the narrower the field it appropriates to itself; the more it neglects other subjects lying outside of that field, so much the more properly is it called a special science. On the contrary, the more comprehensive such knowledge is, the more philosophical it is; for philosophy is an attempt as far as possible to know the world as a whole. As William James says, "philosophy must include the results of all the sciences and cannot be contrasted with the latter. It simply aims at making science what Herbert Spencer calls 'a system of completely united knowledge.' In the more modern sense, of something contrasted with the sciences, philosophy means 'metaphysics' The older sense is the more worthy sense, and as the results of the sciences get more available for coördination, and the conditions for finding truth in different kinds of questions get more methodically defined, we may hope that the term will revert to its original meaning. Science, metaphysics, and religion may then again form a single body of wisdom and lend each other mutual support."

The history of European philosophy is commonly divided into three main epochs, each characterized by a unique development, although at the same time the earlier periods furnish preface and starting point for those that succeed them, so that the whole development is continuous. The first of these periods is that of ancient or Greek philosophy (q.v.). It extends from the earliest formulations of philosophic conceptions among the Ionian philosophers and continues into the Christian era, throughout the dominance of paganism. While shared by other nations of antiquity besides the Greeks, as notably by certain Romans, Jews, and Græco-Egyptians, it received its form and lasting bent from the Greek mind, and its later influence proceeds almost exclusively from Athenian culture (See GREEK PHILOSOPHY.) The second period is that of mediæval philosophy, in which scholasticism (q.v.) was the dominant attitude. It had its rise in the theological speculations of the early Church fathers, usually educated in Greek thought, and was continued and developed throughout mediæval times as the characteristic philosophy of Catholic Christianity. It had its culmination in the great synthesis of Thomas Aquinas, but has never ceased to be the traditional philosophy of the

Church, and in modern times, as neoscholasticism, is the subject of an energetic revival. During the scholastic period in Christian Europe the tradition of Greek philosophy was kept alive by the Arabs in Spain (see ARABIC LANGUAGE AND LITERATURE), among whom were many important philosophical thinkers. The third period is known as the period of modern philosophy and is commonly dated from the Renaissance (q.v.) and more particularly from the advocacy of empirical methods of investigation by Bacon and of appeal to immediate reason or intuition by Descartes.

With the revival of learning there was also a revival of all the important philosophical systems of antiquity. Platonism flourished in the Academy of Florence and found its most important advocate in Ficino. Neo-Platonism blended with Neo-Pythagoreanism, which was represented by Pico della Mirandola. Aristotelianism renewed its vigor in the two rival schools of Averroism and Alexandrism, and among the Protestants in Melancthon. Skepticism was defended by Montaigne, Sanchez, and Charron; eclecticism, virulent in its opposition to scholasticism, was propagated by Valla, Vives, de la Ramée, and Zwingli, while scholasticism found its champion in Suárez. Natural philosophy, a rehabilitation of one phase of Aristotle's system, but blended with Neo-Platonic mysticism, was developed by Cardano, Campanella, and especially by Bruno. Paracelsus and Böhme elaborated the mystical side of this line of thought, while Galileo and Kepler remained more true to an empirical study of nature and formed the starting point of a mechanistic and materialistic conception of the universe. In Kepler, however, with his insistence on the harmony of the world order, we have a distinctively Pythagorean touch. Political philosophy took an entirely new start with Machiavelli, who threw aside the work of Aristotle and the authority of the Church and worked out a theory in which the state and civic freedom were all-important. But though the philosophers of the Renaissance thus bridged over the chasm that separated the ancient from the modern world of thought, it was reserved for Bacon and Descartes to lay the foundations of modern philosophy in empiricism on the one hand and in rationalism on the other: and from Kant's time one of the aims of philosophy has been to rear a superstructure which should rest on both these foundations. As was to be expected, the foundations had first to be laid independently, and as a result we have two great modern schools—one has defended the position that all secure knowledge rests on experience; the other has demanded that in all satisfactory knowledge the requirements of reason be met.

Modern empiricism came to articulate expression first in Francis Bacon, who insisted upon the abandonment of the deductive, *a priori* speculation of the schoolmen and upon the necessity of studying nature without bias. Hobbes followed Bacon in urging the necessity of a philosophy of experience: but being especially interested in human nature, and yet lacking the data for an inductive study of society, he allowed himself to construct society out of imaginary isolated human beings and to palm off this fiction for fact.

Modern rationalism began with Descartes, who is often called the father of modern philosophy. He likewise emphasized the necessity of begin-

ning anew, but, unlike Bacon, he looked to the inner nature of self-consciousness for the principles that can build up the structure and furnish the certainty of knowledge. The Cartesian system is rationalistic; the method for advancing our knowledge was thought to consist in letting the light of reason shine forth. This was accomplished by the application of mathematical method to metaphysics, with the result of bringing out the innate truths and principles of reason. In this way we become assured, so Descartes argued, of our own existence, of the existence of God, and of that of the material universe. Descartes sharply separated mind and matter: mind is thinking, unextended substance; matter is unconscious, extended substance. Two great problems are therefore handed down to his immediate followers. What is the relation between mind and matter in general, and the soul and body in particular? And what is the relation between the soul and God? Geulincx, the founder of Occasionalism (q.v.), answers the former question by saying that God acts in the individual, intervening on each occasion to maintain the harmony between mind and body. God is the real subject of human acts, the individual being but a nominal subject. The second problem is taken up by Malebranche, who maintains that the individual thinks in God. The individual is nothing but the mode of God's being. The mind is in God and in Him views everything in its eternal significance. Spinoza carries out Cartesianism to its logical conclusion. Substance is that which exists independently. Hence the infinite alone, God, is true substance. Mind and matter are two attributes of the one divine substance. They are known to us as the parallel manifestations of the hidden substantial identity in God. Spinoza develops his system by pure deductive reasoning, following the procedure of geometrical demonstrations. He thus exhibits the ideal method of rationalism, which regards reason, working solely on its own inner principles, as capable of discovering the true nature of reality. The moral and physical parts of the universe follow from these principles with the same rigid necessity as the *demonstranda* of geometry follow from its axioms. Joyful resignation to this rationalistic determinism is the essence of morality. Spinozism reduces the dualism of mind and matter to a common principle and thus develops a pantheistic monism (q.v.) Leibnitz endeavors to solve the paradox of Spinozism that unextended and extended substances are ultimately identical. As a rationalist he sides with Spinoza; as an individualist he sides with Locke. Leibnitz's substance is not that which *exists* through itself, but rather that which *acts* through itself. Reality consists of an infinite number of monads (see MONAD), which are unextended, spiritual activities, centres of original forces, or *formal atoms*. Each atom is self-contained and cannot be modified from without. Spinoza surrenders the reality of individuals to the principle of unity. This unity Leibnitz breaks up into a plurality of independent, self-active monads. But the multiplicity is synthesized by the Leibnitzian principle of continuity and the law of preestablished harmony (q.v.). All the monads belong to an organized system, and each mirrors or represents the universe. The individuals are not isolated, but belong to an organic whole. God, the supreme monad, is pure activity, while

finite monads are in a state of imperfect realization. They are not completely active. It is the passivity of finite monads that gives rise to confused perceptions, in which consists the appearance of an extended, material world. These fundamental principles of Leibnitz's system are modified by his follower, Wolff, who adopted merely the rationalistic method of his master and reduced philosophy once more to scholastic form. This was the culmination of dogmatic rationalism on the Continent.

In the meantime the empiricism begun by Bacon and the rationalism begun by Descartes became curiously intermixed in Locke's theory of knowledge. Locke supported the Baconian appeal to experience. The sole sources of our knowledge are empirical facts, since the mind has no innate ideas. All the materials of knowledge are externally impressed upon the mind, the sole activity of which consists in linking together the given ideas. Upon this sensationalistic basis, however, Locke built up a rationalistic ideal of knowledge. We attain certainty in our intuitive knowledge of the existence of the self, and in the demonstrative knowledge of the existence of God, and of mathematical and moral truths as well. Our knowledge of the external world, being dependent on sense perception, reaches only the level of probability. In this Locke violated his own fundamental principle that our knowledge extends no further than our sensationally given ideas, and that truth consists in the agreement of ideas among themselves, not in their correspondence with things or external reality. Berkeley took Locke's definition of knowledge in a strict sense and insisted that we never get beyond the circle of our own ideas. We know nothing about the agreement of our subjective ideas with external things. All knowledge, he contended, is purely individual, and all ideas are merely particular. The mistaken belief in the existence of an external material object is attributable to the confusion of taking an abstract or general name as representative of a real thing. The reality of sense objects consists in their being perceived. The assumption of an object apart from the idea is as useless as its existence would be. Ideas signify nothing but modifications of the conscious subject. Hume carried empiricism to its inevitable logical consequence. Nothing is knowable, he argued, but conscious experiences—"impressions" and their copies, "ideas." These we cannot transcend. Ideas are externally connected by "gentle forces," called relations or associations. We cannot prove the existence of God, of the self, of matter, or of cause. All these are fictions of the imagination and have no basis in actual experience. Thus, step by step, empiricism ends in skepticism.

Kant, the founder of the critical philosophy, consciously and critically attempted what Locke had naively achieved: the arbitration of the controversy between empiricism and rationalism. His decision was that rationalism is right in its determination of scientific method; empiricism, in limiting scientific knowledge to the sphere of possible experience or phenomena. Knowledge, he maintained, is a joint product of two factors—one furnished by the conscious subject, the other given in the raw material of sensation. The former is *a priori*; it antedates experience and is the condition that makes experience possible. The latter is *a posteriori*, given from

without. The *a priori* would be devoid of content without the sensible material; the *a posteriori* would be nothing at all were it not shaped and transfigured in the mold of consciousness. Theoretical reason may not transcend the bounded domain of experience, but practical reason postulates as morally necessary a world of transcendent reality, in which moral order is the fundamental law. God, freedom, and immortality, though undemonstrable, are the necessary presuppositions of our moral being. Thus reason gives way to faith. Fichte, starting from a Kantian basis, objected to Kant's failure to show how the *a priori* principles of consciousness are necessarily involved in the nature of consciousness, as well as to the Kantian separation of the phenomenal world and the real world of things in themselves. By exhibiting the process in which consciousness unfolds itself, we see that the phenomenal world is meaningless unless organically connected with its intelligible essence. Knowledge is neither in whole (Hume) nor in part (Kant) the product of sensation. It is the creation of the ego. Voluntary selves freely choose to assert themselves and thus construct their whole organized world. The moral law is the prior condition of all we theoretically know, and the outer world exists simply for the sake of our moral self-realization. The speculative method, the exhibition of the progressive nature of consciousness, is the only possible method, since knowing does not begin with facts passively received by the ego, but with a spontaneous act of the ego's creative energy. Jacobi also objected to the Kantian separation between the thing in itself and the phenomenal world. Without the thing in itself, he said, no one can enter the Kantian system, and with it no one can remain in that system. The only solution of this antinomy was to exalt faith, to which even Kant had recourse, to the supreme place in philosophy. Not knowledge, but feeling, is the organon whereby we can attain certainty of reality. Thus results a philosophy of supernatural sensualism. Schelling reached much the same result, but by a different method. He regarded the world as the embodiment of intelligence, an objective fact, indeed, but one that exhibits in its progressive forms the same principle that is found in man. But the character of that absolute principle which thus manifests itself in external nature and in man cannot be apprehended by reason. Intuition alone brings us into contact with ultimate reality. In Hegel German rationalism vigorously reasserted itself: the real is the rational, and the rational is the real. All reality is but a manifestation of reason. The world is a development of thought. But thought and reason are not abstractions. The word "thought" is used with a width of meaning that includes in it the concrete content of the world of sense organized into an all-inclusive universe. The life and stir of the universe is the life of thought. The development of this concrete thought is a dialectical development; hence philosophy must employ the dialectical method to exhibit the nature of reality. The motive force of this development is opposition and negation. Everything is what it is by virtue of what it is not, i.e., by virtue of its relation to other things. These various things taken apart are self-contradictory; only when seen in their interconnection are they seen to be real. The contradictories are not annulled in their mu-

tual relations; they are conserved, but thus conserved no longer are they contradictory. The tracing of this process of negation is the Hegelian dialectic. With the death of Hegel, Hegelianism broke up into warring schools and became utterly discounted in Germany, only to be resuscitated later in England and America in the so-called Neo-Hegelian school.

Schleiermacher took up the philosophical problem where Fichte, Schelling, and Jacobi had left it. He agreed with Jacobi that thought cannot grasp the essence of reality; hence philosophy is not a complete science; but while it is not complete, it is ever growing and reaching out towards the goal of the identity of thought and being. This goal, however, can be reached only in religion, the communion of the finite with the infinite upon which it feels itself dependent. In Herbert and Schopenhauer there is a twofold opposition to Hegelianism: the former opposed his doctrine of real qualities to Hegel's idealism; the latter directed his pessimism (q.v.) against the idealistic estimate of the value of existence and maintained that the real is an irrational principle of blind impulse. Beneke attempted to synthesize the results of previous philosophical activity by developing a psychological philosophy, based on inner experience. Self-consciousness reveals directly to us the psychic constitution of man; sensation is only mediate knowledge of the outer world, which must be interpreted after the analogy of psychic life. Lotze combined the Hegelian and Herbartian positions, while Hartmann aimed at a synthesis of Schopenhauer and Hegel. Among recent German thinkers the cry of "Back to Kant" has been especially prominent; this Neo-Kantianism has been represented by such men as F. A. Lange, Hermann Cohen, J. I. Volkelt, Alois Riehl, and Friedrich Paulsen. Another recent vigorous German school is that of the so-called immanent philosophy of W. Schuppe, Johannes Rehmke, and Richard von Schubert-Soldern, who deny the antithesis of idea and object and assert an identical unitary consciousness in all beings. The immanent content of this consciousness is the world of space and time. Allied to this immanent philosophy is the empiriocriticism of Richard Avenarius, who, like Schuppe, begins, not with the opposition of subject and object, but with the pure experience of the unsophisticated man free of all preconceived theory. In this experience the so-called object of consciousness is an integral part, and of this experience philosophy is an exact description. Materialism had a temporary revival in the middle of the nineteenth century in Germany; its champions were Karl Vogt, Rudolf Wagner, Jacob Moleschott, F. K. C. Ludwig, Büchner, Czołbe, and perhaps, later, E. K. Dühring. Sometimes identified with materialism is the monism of Haeckel, who, however, is not a materialist but an animist, holding all matter to be instinct with life; but inasmuch as the material, not the conscious, side of being is emphasized, the doctrine is closely allied to materialism. Fechner had some years before Haeckel advocated an animism, which, however, had emphasized the conscious side of being. Wundt's philosophy is related to Fechner's, inasmuch as he holds that the mechanical universe is "the outer wrapper behind which is hidden a spiritual creative activity, a striving, feeling, sensing, like that which we experience in ourselves." Holding

that conation is the most fundamental essence of this activity, his view is voluntaristic. Another influential voluntarist, Nietzsche, holds that ultimate reality is will to power and that thought is only a means which some wills to power develop and use to secure more power. In contrast to these movements we have a new inspirational idealism of which Rudolf Eucken and Heinrich Rickert are the protagonists.

Returning now to French philosophy, we may say that after the time of Descartes the most influential thinkers in France were Rousseau and Comte. Deserving of mention are Bayle, the skeptic; Voltaire, more positive in his attitude and with a leaning towards mechanism; La Mettrie and Condillac, sensationalists; La Rochefoucauld and Helvétius, egoists; Bonnet, a rationalistic sensationalist; Diderot and D'Alembert, pantheists. The last three, along with minor thinkers, are known as the Encyclopædists, because of their coöperation in the issue of the great *Encyclopédie*. During the French Revolution the predominant philosophy was sensationalism, going under the name of ideology, given it by Destutt de Tracy. Cabanis emphasized the physiological basis of sensationalism; a little later Maine de Biran, starting with the psychological fact of self-consciousness, reached a view similar to Beneke's, in which the spiritual nature of self-activity received recognition. He was thus the forerunner of spiritualism (q.v.), which was championed by Jouffroy and Royer-Collard and had in Cousin its most prominent exponent. Spiritualism lived through the nineteenth century, being later represented by Ravaisson, Secrétan, and Vacherot. Opposed to ideology were the traditionalists, who, while reaching spiritualistic results, were hostile to the method of the spiritualists. Accepting the Catholic doctrines as unimpeachable, they emphasized the supremacy of faith above reason. Reason inaugurated the Reformation and issued in the Revolution; it is the source of nothing but evil. Faith resting on inspired authority is alone able to reach the truth. So wrote De Maistre, Frayssinous, and Bonald. But reason would not down, and turned its attention to the social nature and relations of human beings. Saint-Simon, the founder of the French Socialistic school, was not himself so much a philosopher as a reformer; he practiced rather than theorized, but he interested many speculative minds in social problems. The greatest of his disciples was Auguste Comte. Comte contended that the only true and final philosophy is positive; true philosophy is an accurate description of facts and their experienced relations. He brushed aside all pretense of knowledge of anything more ultimate than the phenomena of existence. Positivism, however, according to Comte, is only the third stage of philosophical reflection. Man's first attitude towards nature was theological; he attempted to explain phenomena by referring them to supernatural powers. Then man became metaphysical, using abstract conceptions, like force, as principles of explanation. Finally, as the third stage, came positivism, the insight into the futility of previous explanations, and the recognition of facts and their relations as philosophical ultimates. About the middle of the nineteenth century, in protest against Comte, a revival of Platonism occurred in certain Catholic circles: Cartuyvels, Hugouin, and Gratry maintained that ideas are modes of God's es

sence. Positivism passed over into agnosticism in Littré, Taine, and Renan. With the development of experimental psychology a psychological philosophy has been cultivated by Ribot, Delboeuf, and Bernard. After Darwin's *Origin of Species* appeared, evolutionism was eagerly taken up by French thinkers, chief among whom have been Fouillée, Guyau, and Bergson. Bergson maintains that current doctrines of evolution err in regarding the future as determined whether by mechanical laws or by purpose. The development of life always, on the contrary, brings something new and incalculable. Against the determinism (q.v.) of positivism, psychologism, and evolutionism Boutroux likewise advocates a philosophy of contingency and freedom. But Kantian principles maintained their ground in the philosophy of Renouvier and his followers. Lachelier attempted a combination of Kantianism and spiritualism.

Since Bruno's time Italy has made little original contribution to philosophy, although she can boast of many brilliant expositors of already existing systems. Vico and Beccaria can lay the best claim to originality, both working in the realm of the philosophy of law. Genovesi, the empiricist; Galluppi, the sensationalist; Rosmini and Gioberti, objective idealists; Mamiani, a modified Platonist; Vera and Spaventa, Hegelians; Testa and Cantoni, Kantians; Villari and Dominici, positivists; and Bonavino, Thomist—deserve passing mention. Giovanni Papini champions a very radical form of pragmatism, while Benedetto Croce is giving vogue to a revival of Hegelianism.

For the last two centuries Great Britain has shared with Germany the honor of having distinctive national philosophies. English thought has been predominantly empiricist and associationistic until the last half century. Hartley gave associationism (see ASSOCIATION OF IDEAS) its modern form, and James Mill applied it to all the life of mind. John Stuart Mill, known by his utilitarianism (q.v.), did his greatest philosophic work in logic. True to empiricism, he introduced induction into the place it now occupies in logical theory, and yet he builded better than he knew. His empiricism did not furnish an adequate basis for his logic, and subsequent logicians, such as Sigwart in Germany and Bosanquet in England, have succeeded in effecting a reconciliation between empiricism and rationalism in logic; but this they could not have done without Mill's pioneer work. Bain did little more than follow in Mill's footsteps. Darwin's great discovery has been extremely fruitful in philosophy. Spencer has worked out an evolutionary philosophy in elaborate detail, but with a strong individualistic bias. It is, however, marred by a lack of historic perspective. Lewes represented positivism; Martineau has been the most prominent advocate of intuitionism (q.v.), applying intuitionistic principles especially to ethics and theology. Green, Bradley, and Bosanquet, under the influence of German idealism, have sought to stem the tide of empiricism. Ward, from a psychological starting point, has likewise reached an idealistic result. Under the leadership of these men and of the two Cairds, of Scotland, English philosophy had, in the last decades of the nineteenth century, almost left its empiricist moorings. Bertrand Russell, in addition to much other very important work, publishes voluminously on the philosophy of mathematics,

F. C. S. Schiller became known as a militant pragmatist, and H. Wildon Carr as a Bergsonian. The two journals *Mind* and the *Hibbert Review* serve to support a lively philosophic interest.

The typical philosophy of Scotland since the time of Hume has been intuitionism. Hutcheson may be regarded as its founder. Reid and Stewart gave it classical expression. This Scottish thought was a protest against the Lockean doctrine that knowledge is only a correspondence between ideas and stoutly maintained that we have immediate knowledge of objective reality. Hamilton, in his natural realism, sought to reconcile intuitionism with Kantianism. The two Cairds and Stirling broke away from the intuitionistic tradition and gave Hegelianism a vogue which makes it rival intuitionism in Scotland and empiricism in England.

In the United States the greatest original philosopher was Jonathan Edwards, who, starting from Lockean premises, elaborated under Calvinistic influences a most uncompromising determinism (q.v.). Franklin, while not technically a philosopher, gave an impetus towards empiricism. Witherspoon and McCosh brought strong support to Scottish intuitionism, also taught by Upham and Wayland. Among the educators who early aroused interest in philosophy were Noah Porter, Mark Hopkins, and Daniel Coit Gilman. Laurens P. Hickok was mildly Kantian, Francis Bowen eclectic, B. P. Bowne and G. T. Ladd Lotzeans. The Concord School of Philosophy, headed by Emerson, popularized German idealism, which was strongly defended technically by W. T. Harris; while Josiah Royce gave it a more independent and original statement. James E. Creighton defends a more personalistic form of idealism. William James, a brilliant advocate of empiricism, sought to rescue philosophy from agnosticism by asserting the right of a will to believe in face of doubt; he may be considered the founder of pragmatism (q.v.), although, with characteristic modesty, James himself gives this honor to C. S. Peirce. By his development of pragmatism and radical empiricism, as well as by his great work in psychology, James won for himself recognition as one of the great leaders of the thought of his age. In his work he was ably and independently supported by John Dewey, who gave a more systematic treatment to pragmatistic logic than James was able to give in his more popular writings; and he likewise did notable work in ethics. Two of Dewey's prominent supporters were George H. Mead and Addison W. Moore. George Santayana worked out, in popular rather than in technical form, a philosophy in which mechanism is regarded as the efficient principle of the universe, which ineffective mind appreciates, thus giving value to what has not come about by its agency. In the earlier years of the twentieth century another movement, commonly known as the new realism, gained headway. In large measure a development of one of the factors in James's thought, it found expression in James's pupils, E. B. Holt, R. B. Perry, W. B. Pitkin, and W. P. Montague, but others worked independently in the same field, among them G. S. Fullerton and E. B. McGilvary. F. J. E. Woodbridge is both realist and pragmatist, as indeed are many other realists. A. O. Lovejoy developed temporalism (q.v.). Frank Thilly published as his most important work a history of philosophy, and Fullerton's keenly critical

studies in epistemology are of special importance. Exceedingly important factors in the promotion of recent philosophical thought have been these periodicals: the *Philosophical Review*, the *Journal of Philosophy, Psychology, and Scientific Methods*, the *International Journal of Ethics*, and the *Monist*.

In general, within a century the significance of the history of philosophy has been brought out by a long line of writers beginning with Hegel. The result is an appreciation of the continuity of philosophic development and of the genuine advance made by thought in this field.

Bibliography. General: G. T. Ladd, *Introduction to Philosophy* (New York, 1890); Wilhelm Wundt, *System der Philosophie* (2d ed., Leipzig, 1897); Henry Sidgwick, *Philosophy: Its Scope and Relations* (ib., 1902); W. T. Marvin, *Introduction to Systematic Philosophy* (ib., 1903); John Fiske, *Outlines of Cosmic Philosophy* (4 vols., Boston, 1903); Rudolf Eisler, *Kritische Einführung in die Philosophie* (Berlin, 1905); Harald Höffding, *The Problems of Philosophy*, translated by G. M. Fisher (New York, 1906); F. E. Abbot, *Syllogistic Philosophy* (2 vols., Boston, 1906); J. B. Baillie, *Outline of Idealistic Construction of Experience* (New York, 1906); Friedrich Paulsen, *Introduction to Philosophy* (Eng. trans. by Frank Thilly, 2d Am ed., ib., 1907); Wilhelm Dilthey and others, *Systematische Philosophie* (2d ed., Berlin, 1908); David Graham, *Grammar of Philosophy* (New York, 1908); John Dewey, *Influence of Darwin on Philosophy* (ib., 1910); Oswald Külpe, *Introduction to Philosophy* (Eng. trans. by Pillsbury and Titchener, London, 1910); G. W. F. Hegel, *Phenomenology of Mind* (Eng. trans. by J. B. Baillie, 2 vols., New York, 1910); William James, *Some Problems of Philosophy* (ib., 1911); R. A. C. Macmillan, *Crowning Phase of the Critical Philosophy* (ib., 1912); M. W. Calkins, *Persistent Problems of Philosophy* (3d ed., ib., 1912); O. O. Fletcher, *Introduction to Philosophy* (ib., 1913); J. E. Russell, *A First Course in Philosophy* (ib., 1913); Wilhelm Windelband, *Einführung in die Philosophie* (Tübingen, 1914); Norman Smith, *Studies in Cartesian Philosophy* (New York, 1914); Emile Faguet, *Initiation into Philosophy* (Eng. trans. by Sir Home Gordon, ib., 1914); F. B. Jevons, *Philosophy: What is it?* (Cambridge, 1914); B. A. W. Russell, *Our Knowledge of the External World as a Field for Scientific Method in Philosophy*, Lowell Lectures (Chicago, 1914); Emile Boutroux, *Natural Law in Science and Philosophy* (New York, 1914); Harald Höffding, *Modern Philosophers* (Eng. trans. by A. C. Mason, ib., 1915); History: Friedrich Ueberweg, *History of Philosophy* (Eng. trans. by G. S. Morris from 4th Ger. ed., 2 vols., New York, 1884); Eduard Zeller, *Outlines of the History of Greek Philosophy* (Eng. trans. by Alleyne and Abbott, 1889 et seq.); J. E. Erdmann, *History of Philosophy* (Eng. trans. by W. S. Hough, 3 vols., ib., 1890-1910); Theodor Gomperz, *Greek Thinkers: A History of Ancient Philosophy* (Eng. trans. by Magnus and Berry, 4 vols., ib., 1901-12); Henry Laurie, *Scottish Philosophy in its National Development* (ib., 1902); Leslie Stephen, *History of English Thought in the Eighteenth Century* (3d ed., ib., 1902); C. M. Bakewell, *Source Book in Ancient Philosophy* (ib., 1907); I. W. Riley, *American Philosophy: The Early Schools* (ib., 1907); Albert Schweigler,

History of Philosophy in Epitome (new ed., trans. by Seelye, ib., 1908); M. M. de Wulf, *History of Medieval Philosophy* (Eng. trans. by Peter Coffey, 3d ed., ib., 1909); J. L. Perrier, *Revival of Scholastic Philosophy in the Nineteenth Century* (ib., 1909); T. M. Forsyth, *English Philosophy: A Study of its Method and General Development* (ib., 1910); Wilhelm Windelband, *History of Ancient Philosophy* (Eng. trans. by H. E. Cushman, 3d ed., ib., 1910); H. O. Taylor, *The Medieval Mind* (2 vols., ib., 1911); J. M. Kennedy, *Religions and Philosophies of the East* (ib., 1911); Harald Höffding, *Brief History of Modern Philosophy* (ib., 1912); James Seth, *English Philosophers and Schools of Philosophy*, in "Channels of English Literature Series" (ib., 1912); Oswald Külpe, *Philosophy of the Present in Germany* (Eng. trans. by Patrick, ib., 1913); H. E. Cushman, *Beginner's History of Philosophy* (2 vols., Boston, 1913); Frank Thilly, *History of Philosophy* (New York, 1914); A. W. Benn, *Greek Philosophers* (2d ed., 2 vols., ib., 1914); R. A. Nicholson, *The Mystics of Islam* (London, 1914); J. T. Merz, *History of European Thought in the Nineteenth Century* (4 vols., New York, 1915); John Dewey, *German Philosophy and Politics* (ib., 1915); I. W. Riley, *American Thought from Puritanism to Pragmatism* (ib., 1915); C. C. J. Webb, *History of Philosophy*, in Home University Library (ib., 1915). Dictionaries, etc.: W. S. Sonnenschein, *Bibliography of Philosophy* (London, 1897); J. M. Baldwin, *Dictionary of Philosophy and Psychology* (2 vols., New York, 1911); Rudolf Eisler, *Philosophen-Lexikon: Leben, Werke, und Lehren der Denker* (Berlin, 1912).

PHILOSOPHY, MORAL. See ETHICS.

PHILOSOPHY OF THE ENLIGHTENMENT. See ENLIGHTENMENT, PHILOSOPHY OF THE.

PHILOSTRATUS (Lat., from Gk. Φιλόστρατος). The name of four sophists of the Roman Imperial period. According to Suidas the first three were all natives of the island of Lemnos. 1. The first PHILOSTRATUS lived in Nero's reign (54-68 A.D.). The only extant work of his is the dialogue *Vero*, a conversation between the Lemnian Menecrates and the banished philosopher Musonius Rufus on the Emperor's proposed canal across the Isthmus of Corinth and on his great cruelty. 2. FLAVIUS PHILOSTRATUS flourished under Septimius Severus (193-211 A.D.) and his successors. At the request of the Empress Julia Domna he wrote a remarkable *Life of Apollonius of Tyana*, in which he laid especial stress on the miracles ascribed to this pagan saint. The work was used later to oppose the teachings of the Christians. It has been translated into English by J. S. Phillimore (2 vols., Oxford, 1912) and by F. C. Conybeare (2 vols., London and New York, 1912). The same Philostratus is the author of the extant *Lives of the Sophists*, written soon after 229 A.D. 3. The third PHILOSTRATUS, son of Nervianus and son-in-law of Flavius Philostratus, was a young man in the reign of Caracalla (211-217 A.D.). He composed a work entitled *Imagines* (Εἰκόνες), which is still extant and describes 64 paintings in Naples. 4. The last PHILOSTRATUS was a grandson on his mother's side of the third Philostratus. He also wrote an *Imagines*, after the manner of his grandfather's book. This work is inferior to its model and in its present form breaks off in the description of the seventeenth painting. The

Imagines of the third Philostratus at least have now been proved to be descriptions of actual works of art and so are of great value to the archaeologist. The dialogue *Heroicus* probably belongs to the third sophist, while the second apparently was the author of the interesting collection of *Letters*. The standard edition of all these works is by Kayser in the Teubner collection (2 vols., Leipzig, 1849). The *Imagines* of the third Philostratus have been separately edited by the members of the Vienna Classical Seminary (Leipzig, 1893). Consult J. S. Phillimore, translation of Philostratus, vol. i, pp. xxxiv-xlv (Oxford, 1912), and Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

PHILO'TAS (Lat., from Gk. Φιλώτας). A Macedonian general. See PARMENION.

PHILOXENIAN (fil'ók-sē'nian). **VERSION.** See BIBLE, *Text of the New Testament*.

PHILOXENUS (Lat., from Gk. Φιλόξενος) (435-380 B.C.). A famous dithyrambic poet, born in Cythera. When the Spartans recaptured the island from the Athenians, probably after the Sicilian expedition, he became a slave. Eventually he passed into the hands of the poet Melanippides, who, attracted by his talent, educated and freed him. He lived some time at the court of the elder Dionysius in Syracuse. There he forfeited the tyrant's friendship either on account of his frank criticism of his patron's verses or because of his love for a beautiful flute player, Galatea, the mistress of Dionysius, and was imprisoned in the quarries. Philoxenus subsequently took vengeance on Dionysius, who was blind in one eye, by composing the most famous of his dithyrambs, *The Cyclops*, in which he represented himself as Odysseus winning from the Cyclops the affections of his sweetheart, the nymph Galatea. This was the model for Theocritus' eleventh idyl. After leaving Syracuse Philoxenus lived at Tarentum and later in Greece and died at Ephesus. He wrote 24 dithyrambs in all, which were greatly admired in antiquity. Of these only insignificant fragments remain. The poem entitled *The Banquet* (Δείπνον), of which much is extant, is generally ascribed to this Philoxenus; but some considered it as the work of a Philoxenus of Leucas. The fragments are published by Bergk, *Poetae Lyrici Graeci*, vol. iii (Leipzig, 1882; reprinted, 1914).

PHILTER, or **PHILTRE** (Lat. *philtrum*, from Gk. φίλτρον, *philttron*, φιλητρον, *philetron*, love charm, from φίλειν, *philein*, to love). An artificial means of inspiring and securing love. A belief in such charms seems to have been generally prevalent from an early day. Among the Greeks and the Romans (among the latter in the later days of the Republic and under the emperors) love charms, and especially love potions, were in continual use. Probably certain poisonous or deleterious herbs and drugs were among their chief ingredients, to which it is said that other substances, animal as well as vegetable, were added, besides the employment of magic rites. Thessaly was famous for producing the most potent herbs, and her people were regarded as the most skillful practitioners of magic arts, whence the well-known *Thessala philtra* of Juvenal (vi, 610). These potions were violent and dangerous, sometimes producing madness and death instead of merely serving the purpose for which they were intended. The use of philters seems to have been not unknown during

the Middle Ages, and in the East belief in the power of love potions has never died out.

PHINEAS (fin'ées) **FINN**, THE IRISH MEMBER. A novel by Anthony Trollope (1869). It is the first of a series of political tales, *Phineas Redux*, *The Prime Minister*, and *The Duke's Children*, in which Finn and most of the characters of the story reappear.

PHINEUS, fin'és-ús or finús (Lat., from Gk. Φινεύς). A blind soothsayer, the son of Agenor, and King of Salmydessus in Thrace. Because of his cruelty to his children by his first wife, when his second wife accused them falsely, he was punished with blindness and was tormented by the Harpies, who seized or defiled all the food placed before him. He was delivered from the monsters by Zetes and Calais, the sons of Boreas, and in return directed the Argonauts in their expedition. Some of the traditions represent him as having been slain by Heracles or by Boreas.

PHIN'TIAS (Lat., from Gk. Φιντίας). A friend of Damon. See DAMON AND PHINTIAS.

PHIPPS, CONSTANTINE HENRY. See NORMANBY, C. H. PHIPPS, MARQUIS OF.

PHIPPS, CONSTANTINE JOHN. See MULGRAVE, C. J. P., second BARON.

PHIPPS, HENRY (1839-). An American steel manufacturer and financier, born in Philadelphia, Pa. He was educated in the public schools of Allegheny City. Five years after he had begun (1856) as office boy for a Pittsburgh firm, he became the partner of one of his quondam employers in a distributing agency for the Du Pont Powder Company, at this time he was also part owner of a small iron mill. His success in these ventures led to his association with Andrew Carnegie and to his becoming eventually, next to Carnegie, the largest stockholder in the Carnegie Steel Company. On the organization of the United Steel Corporation, in 1901, Phipps became one of the directors of that concern and shared in the enormous profits which the original stockowners of the Carnegie Company derived from the transaction. A multimillionaire, Phipps now devoted much money and time to philanthropic and artistic undertakings. He contributed large sums to aid in the treatment and elimination of tuberculosis in Philadelphia and other cities, and also gave \$1,000,000 to the University of Pennsylvania for the endowment of the Phipps Institute. He also built a psychiatric clinic for Johns Hopkins Hospital, Baltimore.

PHIPPS PSYCHIATRIC CLINIC. An institution established in 1913 for the study and treatment of mental diseases, a part of the Johns Hopkins University (q.v.). The clinic was intended by its founder, Henry Phipps, to provide for "the better care of patients suffering from mental diseases, especially in the earlier and often curable stage, under conditions similar to those of a general hospital." Besides an ambulatory service there are accommodations for 100 hospital cases. The institution is equipped with every device for the investigation, study, and treatment of neuropathic patients, has well-appointed laboratories, and provides for the higher education and training of graduate physicians, students, and nurses in this special branch of medicine. In the hospital itself the latest methods of hydrotherapy and mechanotherapy are utilized, together with the scientific application of recreation, occupation, music, etc., in suitable cases. Provision is made

also for the supervision of patients at their homes. The director is Dr. Adolf Meyer.

PHIPS, or PHIPPS, SIR WILLIAM (1651-95). The first royal Governor of Massachusetts. He was born at a border settlement, since called Woolwich, on the Kennebec River in Maine, and was one of a family of 26 children, all of the same mother. Till 18 years of age he was employed in keeping sheep, but, dissatisfied with this occupation, he became a ship carpenter and removed to Boston. There he learned to read and write and also married a widow with some property. Some years later he conceived the idea of fishing up treasure stored in a Spanish galleon that had been wrecked 50 years before in the West Indies. The English Admiralty fell in with this plan and gave him command of a frigate, but after a long search he returned unsuccessful. A little later he was sent out again in a vessel provided by the Duke of Albemarle and others. This time he found a wreck and took from it treasure to the value of about £300,000. As a reward for his success he received as his share £16,000, the honor of knighthood, and the appointment as sheriff of New England. In 1690 he was sent by Massachusetts with a fleet of eight vessels against the French settlement of Port Royal (now Annapolis in Nova Scotia) in Acadia and succeeded in capturing it. Later in the same year he commanded a larger expedition, consisting of 34 vessels and more than 2000 men, against Quebec. So active, however, were the French under Count Frontenac that the attempt failed, and on the way back to Boston nine of the vessels were wrecked. In 1692, through the influence of Increase Mather (q.v.), the agent of the Colony in England, Phips was appointed Governor of Massachusetts under the new charter. One of his first official acts was to commission a special court for the trial of those accused of witchcraft, but some months later he suspended its sittings. As Governor he displayed many of the bluff and choleric traits of a sea captain; among other things he cudgelled Brinton, the collector of the port of Boston, and caned Captain Short of the royal navy. In 1694 he was summoned to England to answer complaints made against him and while there died suddenly of a malignant fever. Phips was a man of great energy and determination, but possessed no remarkable intellectual capacity, and he appears to have been strictly honest in his private dealings, though he deemed it no sin to steal from Frenchmen. There is a curious life of him in Cotton Mather's *Magnalia* (London, 1702), but more trustworthy is that by Francis Bowen in vol. vii of the first series of Sparks's *American Biography* (New York, 1834-37). Consult also: Thomas Hutchinson, *History of Massachusetts Bay* (Boston, 1764-67, and London, 1828); Ernest Myrand, *Sir William Phipps devant Québec, 1690* (Quebec, 1893); Francis Parkman, "Count Frontenac and New France under Louis XIV," in *France and England in North America*, part v (Boston, 1903).

PHIZ. See BROWNE, HABLOT KNIGHT.

PHLEBITIS, flē-bī'tis (Neo-Lat., from Gk. φλέψ, *phleps*, vein), or INFLAMMATION OF THE VEINS. Although seldom an original or idiopathic disease, it is a frequent sequel of wounds, in which case it is termed traumatic phlebitis, and is not uncommon after childbirth. (See PHLEGMA'SIA ALBA DOLENS.) It commonly arises by the extension of an inflammation from

contiguous structures, as in phlegmonous erysipelas or cellulitis, or by the plugging up of a vein by an infective embolus. If severe the disease begins with a chill or chilly sensations and a rise in temperature. There is great tenderness and pain along the course of the affected vessel, which feels like a hard knotted cord, and if superficial may be rolled under the fingers. If the vessel is small the consequences of its obstruction may be of little importance, but when a large vein is affected the consequences are always dangerous and may be fatal.

Phlebitis may terminate in one of several ways. The most favorable is by simple resolution—the clot is absorbed, the vein becomes permeable, and circulation is reestablished. In other cases organization of the clot takes place, little blood vessels growing into it, from the walls of the vein, the whole finally becoming a fibrous cord. The circulating blood is diverted to other channels, which gradually dilate to accommodate the increased flow. Again, the clot may become infected, if it is not so from the beginning, undergo purulent softening, and the pus either be discharged by the formation of abscesses or be emptied into the blood current to be carried by the general circulation to all parts of the body. These purulent particles find lodgment in the large viscera, such as the liver, spleen, kidneys, and give rise to multiple abscesses. In the liver this frequently happens from inflammation of the portal veins. This general distribution of septic material is known as pyæmia (q.v.). An organized clot may in rare instances become calcified by the deposition in it of lime salts and form a phlebolite or vein-stone (q.v.).

The treatment of phlebitis comprises rest in bed, elevation of the part, and the local application of antiphlogistics—lead water and opium at first, hot fomentations later. If abscesses form they must be opened and drained. In certain cases it is possible to ligate the vein above and below the clot, open the vessel, and wash out the purulent material. The internal treatment varies with the symptoms, but in general must be stimulating.

PHLEBOLITE (from Gk. φλέψ, *phleps*, vein + λίθος, *lithos*, stone). A calcareous concretion formed by the degeneration of coagulations in veins and therefore also called vein-stone. It is not infrequently to be felt as a nodule, varying in size from a pinhead to a small bean, along the course of chronically inflamed veins of the lower extremity. Phlebolites sometimes attain considerable size.

PHLEBOTOMY. See BLEEDING; VENESECTION

PHLEGETHON, flēg'ē-thōn (Lat., from Gk. φλεγθων, from φλέγειν, *phlegein*, to burn). In Greek mythology, a river of the lower world, along with Acheron, Cocytus, and Styx (qq.v.). In Homer it unites with Acheron, as does Cocytus, a branch of the Styx. Later writers described its fiery torrent and its scorched and desolate shores.

PHLEGMA'SIA ALBA DOLENS. (Neo-Lat., painful white inflammation), or MILK LEG. A painful general swelling of a limb, due to the obstruction of the veins; a plastic phlebitis. It is due to thrombosis, which in turn may arise from pressure, general disease, or near-by septic processes. Milk leg occurs principally as an affection of women in childhood and occasionally in typhoid fever. The first symptom is a rise

of temperature, which might not attract attention at first. Severe pain first is felt, on the inside of the thigh, in the groin, and in the calf. The limb becomes swollen and oedematous, the skin white and shining or waxy. Blue veins may stand out prominently on the posterior part of the limb. Fibrinous coagula may be detached and carried along in the circulation to some other part, as the lung, forming embolism. This is the chief danger. One or both legs may be affected. The treatment consists of supporting the limb on a higher level than the trunk, punctiliously avoiding any jarring of it; maintenance of the recumbent position for at least a month; fomentations to the limb, which must be wrapped in the intervals in cotton; support of the heart with appropriate drugs; control of pain with analgesics and of insomnia with hypnotics. Suppuration and abscess may occur, in which case the pus must be evacuated. The greatest danger is from pulmonary embolism, which is almost invariably fatal. See PHLEBITIS.

PHLEGREAN PLAIN (Lat. *Phlegræi Campi*). A region west of Naples, embracing the volcanic plain on the Campanian coast from Cumæ to Capua. There legend placed the scene of the combats between the gods and the giants. The Romans filled it with palatial villas, and their poets celebrated its charm and productiveness. The volcanic disturbances to which the region has been subject have left of the magnificent buildings of the Romans only confused ruins, in part submerged under the sea.

PHLEGYAS, φλεγύας (Lat., from Gk. φλεγύας). The son of Ares and father of Ixion and Coronis. His daughter became by Apollo the mother of Æsculapius. Phlegyas was so incensed at her conduct that he set fire to the temple of Apollo, and for this was condemned to everlasting fear in Tartarus, where an overhanging rock threatened continually to fall on him.

PHLIUS, TIMON OF. See TIMON OF PHLIUS.

PHLOEM, phlō'ēm (from Gk. φλοῖς, *phlois*, bark), or BAST. One of the two regions of the vascular system, the other being called xylem (q.v.). Every vascular strand (bundle) consists of phloem and xylem, which are variously related in position to each other. The phloem is characterized by sieve vessels, and in ordinary trees it is external to the xylem (wood) and therefore forms the innermost fibrous region of ordinary bark. These bark fibres were called bast. See BARK; CAMBIUM; CONDUCTION; STEM.

PHLOGISTON. See CHEMISTRY, *History*

PHLOGOPITE (from Gk. φλογώψ, *phlogōps*, flaming red, from φλόξ, *phlox*, flame + ὤψ, *ōps*, face). A magnesium mica, similar to biotite, but differing from it in composition by usually containing fluorine and less iron. It crystallizes in the monoclinic system, has a pearly lustre, and is usually of a light yellow deepening to brown and red. The phlogopite occurs in serpentine rocks and frequently in association with limestone or dolomite. Phlogopite often exhibits asterism, especially when seen by transmitted light, as when a candle flame is viewed through a thin sheet. This property has been shown to be caused by minute needle-like inclusions arranged chiefly in the direction of the rays of the pressure figure, producing a distinct six-rayed star. Phlogopite is found in Finland, Sweden, Switzerland, and in the United States at various localities in New York, New Jersey, and also in Canada.

PHLOX (Lat., from Gk. φλόξ, sort of flower, flame, from φλέγειν, *phlegein*, to burn; connected with Lat. *flagrare*, to burn, Skt. *bhraj*, to shine brightly). A genus of mostly tall, erect, spreading perennial herbs belonging to the family Polemoniaceæ, natives of North America. The



CULTIVATED FORM OF MOSS PINK (*Phlox subulata*).

species, nearly all of which have a wide natural distribution within the United States, have entire leaves and usually very showy flowers, either solitary or in terminal clusters. Owing to their hardiness, easy cultivation, and the size and beauty of their flowers, many hybrid varieties with single and double flowers, in a variety of colors, forms, markings, and a long period of bloom, and a few of the pure species, are grown in gardens, being well adapted for planting on rockeries and in borders and groups. The best-known annual species of this genus is *Phlox drummondii*, a native of Texas, from which all annual phloxes now in cultivation have been derived. *Phlox pilosa* is a somewhat variable species, which flowers from May to August. *Phlox reptans* is native to the Alleghany Mountains. *Phlox stellaria*, native on river cliffs in Illinois, Kentucky, and Tennessee, is much prized as an ornamental plant on account of its numerous white flowers. The ground or moss pink commonly grown in gardens is *Phlox subulata*, which grows wild in rocky and sandy places in the eastern United States. The wild sweet William (*Phlox divaricata*), which prefers rich woods, has pale-lilac or bluish flowers, appearing in spring and in early summer. All species of phlox grow readily in ordinary rich soil; the annuals from seeds and the perennials from seeds, division of the stools, or cuttings of the stems and roots. The seeds are sown early in the spring, given gentle heat, and after the seedlings are large enough they are transplanted, hardened under glass, and later set out in the open. The stem cuttings are made in summer and are placed in fine sandy soil under cold frames or in greenhouses. The root cuttings, when slightly covered with soil and placed in gentle heat, sprout readily. After the cuttings have rooted they may be treated like the seedlings.

PHOBIA. See AGORAPHOBIA; INSANITY, *Borderland and Episodic States*.

PHOCÆA (Lat., from Gk. Φώκαια). The northernmost of the Ionian cities of Asia Minor, about 20 miles northwest of Smyrna, between two harbors, Naustathmus and Lamptra (Map: Greece, Ancient, E 2). It was said to have been originally settled by Phocians. It was included in the Ionian confederacy and was one of the most flourishing and powerful of the Asiatic Greek cities. Its sailors were famous for the daring with which they pushed their vessels into the western seas. The westernmost colony of the

Phocians was in Menaca in Spain, and they were on terms of close friendship with Arganthionus, King of Tartessus. Their most famous colony, however, was Massilia (Marseilles). Unable to defend themselves against Harpagus, a general of Cyrus, they abandoned their city and sailed to Chios (c.540 B.C.). Part of them subsequently decided to return and accept the Persian rule, but the majority sailed to Corsica and settled in Alalia. Though attacked by the Carthaginians and the Etruscans, who resented Greek entrance upon these lands, they were victorious in a great naval battle, but thought it wiser to abandon their settlement and move to southern Italy, where they founded Hyele or Elea (Velia). Phocæa seems to have continued to exist, though it is scarcely mentioned till it was captured and plundered by the Romans in the war with Antiochus. New Phocæa was founded by some Genoese about 1420 because of rich alum mines near by, and this spot is now occupied by a little village, Phokia or Fokia, while the site of the old city is still called Palæo-Phokia.

PHOCAÏS, fōk'ā-is. An epic poem ascribed to Homer, said to have been composed in Phocæa.

PHOCAS (Lat., from Gk. Φωκᾱς, *Phōkas*) (?-610). Byzantine Emperor from 602 to 610. He was an obscure centurion in the army, which was fighting the Avars on the Danube, when in 602 the soldiers rose in rebellion against the Emperor Maurice (q.v.), and Phocas was made their leader. He invested Constantinople and after the forced abdication of Maurice was chosen and crowned Emperor. His first act was to cause the execution of Maurice and his five sons, and throughout his reign he was notorious for his cruelty. In Europe an ignominious peace was maintained, while in Asia unsuccessful war was waged against the Persian King Khosru II (q.v.). He gave his only child in marriage to the patrician Crispus, and the images of the couple were indiscreetly placed by some of their friends in the circus, which was a privilege of royalty only. After this Crispus no longer felt secure, and he conspired with the rebellious exarch of Africa, Heraclius, to dethrone Phocas. This was accomplished in 610, and the tyrant was tortured and beheaded. Consult: J B Bury, *History of the Later Roman Empire*, vol. i (London, 1889); Rudolf Spintler, *De Phoca Imperatore Romanorum* (Jena, 1905); Edward Gibbon, *Decline and Fall of the Roman Empire*, vol. v (edited by J. B. Bury, London, 1912); Cambridge *Medieval History*, vol. ii (New York, 1913).

PHOCAS, (COLUMN OF. A famous column in the Roman Forum, erected in 608 by the exarch Smaragdus in honor of the Eastern Emperor Phocas and once surmounted by a gilded statue of Phocas. The column is 54 feet in height and is of a better style than that which prevailed at the time of its dedication. It is therefore supposed that it may have been taken from some earlier edifice or that an already existing monument was rededicated by Smaragdus. It was covered by the accumulated rubbish of centuries till 1813, when it was unearthed by the Duchess of Devonshire.

PHOCAS, NICEPHORUS II. See NICEPHORUS II PHOCAS.

PHOCIDÆ. See CARNIVORA; PINNIPEDIA.

PHOCION, fōsh'ōn (Lat., from Gk. Φωκίων, *Phōkion*) (c.402-317 B.C.). An Athenian general. He was of humble origin, but received a

good education and studied under Plato and Xenocrates. His first public service was performed under Chabrias in the naval battles at Naxos in 376 B.C. About 349 he was sent into Eubœa to quell a disturbance that had been fostered in Eretria by the partisans of Philip of Macedon and won a victory at Tamynæ. Several years later he led a body of Athenian hoplites to Megara, crushed Philip's faction there, and reestablished the long walls to Nisæa; and he also again conducted a force to Eubœa, where he liberated Orcus and Eretria from Macedonian influence. In 340 he was sent to the Propontis to act against Philip, who, besides suffering a number of minor reverses, found himself forced to abandon the siege of Byzantium and Perinthus. In politics, however, Phocion was a supporter of Philip and an adversary of Demosthenes, though not from mercenary or traitorous motives. When, after the destruction of Thebes in 335, Alexander sent to Athens demanding the surrender of Demosthenes and the other leaders of the anti-Macedonian party, Phocion advised compliance with the King's wishes. The proposal was rejected by the people, and an embassy was sent to Alexander to deprecate his resentment, but not until a second embassy had been sent, at the head of which was Phocion, was the King induced to remit his terms. After the death of Antipater Phocion became implicated in the intrigues of Cassander, the rival of Polysperchon, and was forced to flee to Phocis, but was surrendered to the Athenians and by them condemned to drink the hemlock. His body was carried out of Attica into the Megarid and there burnt. Shortly after his death there was a revulsion of feeling in his favor among the Athenians. They then celebrated his funeral obsequies at the public expense and erected a statue in his honor. Consult Plutarch's *Life of Phocion*, revised edition of translation by A. H. Clough, in Everyman's Library (New York, 1910).

PHOCIS (Lat., from Gk. Φωκίς, *Phōkis*). In ancient geography, a division of northern Greece, bordered on the west by Ozolian Locris and Doris, on the north by Epichemidian and Opuntian Locris, on the east by Bœotia, and on the south by the Gulf of Corinth (Map: Greece, Ancient, C 2). The greater part of the country is mountainous, with Parnassus (q.v.) filling the central and western portion; the northeast, through which the Bœotian Cephissus flows, is fertile. The chief town was Elatea, which commanded the entrance into Bœotia from the north. Other towns of some importance were Daulis, Abæ, the seat of an ancient oracle, and Hyampolis, but the most conspicuous place, from which the land chiefly derived its fame, was Delphi (q.v.), whose inhabitants, however, always declared that the control of the oracle did not belong to the Phocians. The Phocian State was a league of 22 cities, most of which were small. The Phocians appear to have been akin to the Dorians, though there were elements derived from earlier settlers in those regions, and there is some evidence in the southern portion for colonization from Crete and the Peloponnesus. The Phocians do not play a prominent part in the earlier history of Greece, though we hear of a desperate defense against the advance of the Thessalians, and in general they appear as enemies of the Thessalians and the Bœotians and as friends of the Athenians, who supported their claim to control Delphi. In 357 B.C. the Am-

phictyonic Council, apparently, through Theban influence, imposed a heavy fine on the Phocians for cultivating some land belonging to the Delphic oracle. The Phocians resisted the sentence and were favored, but not actively assisted, by Athens and Sparta, who were at that time on bad terms with the council and were hostile to Thebes. The Phocians seized Delphi and "borrowed" the temple treasures with which to maintain their army. For 10 years the war was waged with no decisive results, though in general to the advantage of the Phocians. Even the growing power of Philip of Macedon did not check them, for, while he was victorious in Thessaly, he could not pass Thermopylae, which was held by a Phocian army and an Athenian fleet. The Peace of Philocrates (346 B.C.) between Athens and Philip left the Phocians helpless, and the sentence of the Amphictyons, which expelled them from the council, condemned them to pay an enormous fine and dispersed them into small villages, thus virtually removing them from history. See GREECE, *Ancient History* (the paragraph relating to Philip II, father of Alexander the Great); PHILIP II.

PHOCYLIDES, fō-sil'ī-dēs. (Lat., from Gk. Φωκυλίδης, *Phokylidēs*) (?-c.560 B.C.). A Greek poet of Miletus, contemporary with Theognis. He wrote chiefly didactic poems in two or three verses, in hexameters or in elegiac metre, the 18 extant fragments of which have been included in almost all the collections of the lyric and gnomic poets. Ποιῖμα Νοσήτικόν, the admonitory poem, in about 230 hexameters, which has been preserved under his name, is now supposed to have been the work of an Alexandrine Jew of the first century B.C. Consult: Jacques Bernays, *Ueber das phokylideische Gedicht* (Berlin, 1856); Fenling and Goodwin, an edition with commentary and translation (Andover, Mass., 1879); F. Susemihl, *Geschichte der griechischen Litteratur in der Alexandrinerzeit*, ii, 642 (Leipzig, 1892); Theodor Bergk, *Poetae Lyrici Graeci* (5th ed., ib., 1900; reprinted, 1914); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii (5th ed., Munich, 1911-13).

PHOEBE, fē'bē. 1. A name applied to the goddess Artemis or Diana (q.v.). 2. In Shakespeare's *As You Like It*, a shepherdess in love with the disguised Rosalind.

PHOEBE BIRD. A small olive-green, brown-headed tyrant flycatcher (*Sayornis phoebe*) or pewee (q.v.) of the United States, very familiar in gardens and named in imitation of its call. It makes a cup-shaped nest of mud and moss, which it attaches to rocky ledges and cliffs or to the piers of bridges, eaves of houses, and similar supports. Its eggs are white.

PHOEBUS, fē'būs (Lat., from Gk. φῶιβος, *phoibos*, bright, pure). A title of Apollo (q.v.), which even in Homer has become closely joined to his name. It refers to the god as the purifier from all stains of sin. Originally Phoebus seems to have been an independent deity, but the transparent meaning of the name prevented the development of a personality and made easy the absorption in the great defender from all evil, Apollo.

PHOEBUS, WILLIAM (1754-1831). A pioneer Methodist preacher. He was born in Somerset Co., Md., and entered the ministry in 1783. He was a member of the Christmas conference at Baltimore in 1784; in 1798 he settled in New York and practiced medicine but reentered the ministry in 1806. He desired the Metho-

dist church to be called the Evangelical church of America and wrote a work entitled *An Essay on the Doctrine and Order of the Evangelical Church of America as Constituted at Baltimore, 1784* (1817). He edited the *Experienced Christian's Magazine* (1796).

His grandson, GEORGE A. PHOEBUS (1830-1903), entered the Philadelphia conference, 1853, and afterward became a member of the Wilmington conference. He published *Beams of Light on Early Methodism in America, Chiefly Drawn from the Papers of Rev. Ezekiel Cooper* (1887), a work of very great importance as a source book of Methodist history.

PHENICIA, fē-nish'ī-ā (Lat., from Gk. Φοινίκη, *Phoinikē*, Phœnicia). The name used by the Greeks and the Romans, in its widest application, to designate the strip of territory about 200 miles long, from 5 to 15 miles broad, along the Mediterranean coast of Syria. On the east this tract is bounded by the Lebanon Mountains, being watered by the streams that flow from them. The northern and southern limits are not easily defined, and they varied from time to time. Ptolemy fixes the northern boundary at the Eleutheros (Nahr el Kobir) and the southern at Mount Carmel, but there were undoubtedly Phœnician settlements both farther north and farther south. The origin of the name is unknown. Its derivation from *Phoinix* (date palm) is uncertain, as there is no evidence to show that that tree grew in Phœnicia. A more probable derivation is from the Greek *phoinos* (blood red), referring to the purple (crimson) which the Phœnicians introduced into Greece. In the Old Testament this territory is designated as part of Canaan (q.v.) and the inhabitants as Sidonians. This latter designation occurs also in Homer and points to a period when the land was under the leadership of the city of Sidon. Being shut off from the east and the south by mountain ranges and on the west limited by the sea, it was impossible for Phœnicia to play any important political rôle. Nor were the different settlements ever welded together into one powerful kingdom. They formed a nation, with one or the other holding the hegemony. The northernmost port was Arvad or Aradus (the modern Ruad), mentioned in Ezek. xxvii. 8, 11, and in Assyrian inscriptions, it was situated on an island near Tripolis. A second port was Simyra (Assyr. Sumari or Simirra), mentioned in the Amarna letters (c.1400 B.C.) and in Gen. x. 18. The most important of the northern towns was Gebal, called by the Greeks Byblos (q.v.). It had relations with Egypt and Assyria in very early times and exercised a sort of supremacy over the country around it, rivaling Sidon and Tyre in the south and preserving its independence through the greater period of Phœnician history. The city of Berytus (Beirut) belonged originally to the Principality of Byblos, but afterward became independent. Farther south were the cities of Sidon, Sarepta, Tyre, and Acco (Acre), all of which were old settlements, dating from at least about 1800 B.C., when Egypt inaugurated her Western Asiatic campaigns. Several of these cities stood on islands and were thus fortified by nature. Of these cities Tyre and Sidon (qq.v.) rose to a controlling position and from time to time interchanged as the ruling power. There were also a number of inland towns, such as Kana, but they never attained any importance.

It is impossible to say at how early a date the Semitic population formed settlements in Phœnicia. They must have come upon one of the migratory waves that issued from the Tigris-Euphrates valley, and their close relationship to the Hebrews shows that they branched off with them from the Aramæan wave which formed permanent settlements in northern Syria. At the time the Amarna tablets were written (c.1400 B.C.) the coast towns were all occupied by Semites; and from what is now known of the history of the relations between Babylonia and Syria in early days, the settlement of the Semites in Phœnicia may be placed c.2500 B.C. or earlier. This would agree with the assertion of Herodotus that Tyre was founded about 2730 B.C.

What little is known of the history of Phœnicia may be divided into six periods: (1) from the earliest time to the Egyptian supremacy, c.1800 B.C.; (2) the period of Egyptian control, to c.1400 B.C.; (3) the advance of the Hittites and the Assyrians, to c.1100 B.C.; (4) the period of independent development, 1100 to 900 B.C.; (5) the period of Assyrian and Babylonian control, to the downfall of the Neo-Babylonian dynasty, 539 B.C.; (6) the period of the Persian, Greek, and Roman supremacy. The earliest period must have been dominated by Babylonian influences, since we find Babylonian script and language used as the medium of diplomatic correspondence. This was maintained even after the rulers in the Phœnician and Palestinian cities had become vassals of Egypt. The Babylonian King, Sargon (3800 B.C.; see *SARGON*, 1), extended his conquests as far as Cyprus, and he must have laid a part of Phœnicia under tribute. This view has been challenged, however, by L. W. King, in his *Chronicles Concerning Early Babylonian Kings*, vol. i, chap. ii (New York, 1907); he holds that Sargon carried his conquests rather to the east, to the Persian Gulf. Each settlement at the time formed a sort of independent principality. In the papyrus Anastasi I (sixteenth century B.C.) the Phœnician cities Byblos, Berytus, Sidon, Sarepta, Tyre, and Aradus are mentioned. The influence of Egypt was strong. She exacted a tribute, kept the principalities under native rulers, and discouraged any coalition. The country unfortunately lay between Egypt and her great rival, the State of the Hittites (q.v.). The latter people, having secured possession of the districts around Damascus and Tunip, maintained a successful opposition to the Egyptian armies; and Ramses II was obliged to make a treaty with them, yielding the territory north of Mount Carmel. The city of Tyre was at this time gradually reaching the position of eminence which it kept for several centuries; Sidon (q.v.) played a secondary part, the oldest colonies having been sent out by the former city. In the thirteenth century Assyria began to check the growing power of the Hittites. For a time the coast cities were forced into a position of vassalage; but after the death of Tiglath-pileser I (c.1100 B.C.), Syria, Palestine, and Phœnicia enjoyed a brief respite. In Phœnicia a coalition was formed with Sidon at its head. Tyre, however, set aside her rival and under Abibal (tenth century B.C.) and his son, Hiram, extended her control to Cyprus. It was this Hiram who furnished workmen and material for Solomon's building operations in Jerusalem. (See *HIRAM*.) Assurnasirpal (870 B.C.) re-

ceived tribute from Tyre, Sidon, Byblos, and other cities. Assyria had great difficulty in holding these distant places. Rammanirari III had again to subdue Tyre and Sidon (808 B.C.), and Tiglath-pileser III (734 to 728 B.C.) not only sent one of his generals there, but colonized people of other nations in the district. King Luli (Elulæus) fell off completely from Assyria and, under the leadership of Hezekiah of Judah, made common cause with Tirhaka. Sennacherib (700 B.C.) forced him to flee to Cyprus, putting a new king, Ittobaal, in Sidon. In 678 B.C. Sidon was destroyed, and the various rulers in Phœnicia and Cyprus did homage to the Assyrian King. The power of Assyria was, however, on the wane, and under Psammetik I (625 B.C.) Egypt resumed her sway over the coast. In 585 B.C. Tyre was again invested by Nebuchadnezzar II, but though the other Phœnician cities fell early into his power, it held out for 13 years. King Ittobaal and his family were carried off to Babylon. In 539 B.C. Phœnicia, after the rule of a few legitimate kings, sent there from Babylon, became part of the Persian Kingdom.

During the Persian period Sidon forged ahead of her old rival, Tyre. The seacoast towns, with their large fleets, were necessary for the maritime operations of the Persian kings. Three hundred Phœnician triremes warred with Xerxes against Greece. Eighty Phœnician ships engaged in the battle of Cnidus (396 B.C.). Like its old rival, Sidon became involved in the quarrel of the two great nations who fought for the supremacy of western Asia. Under Tennes II it joined with Nectanebo II of Egypt and might have been successful had not its King betrayed it to Artaxerxes III. This caused a great catastrophe (345 B.C.) in which 40,000 lost their lives. The power of Sidon was broken. On the appearance of Alexander the Great in Phœnicia, Sidon, Aradus, and Byblos immediately submitted, but Tyre held aloof and capitulated only after a siege of seven months (July, 332 B.C.). Eight thousand lost their lives, 30,000 were sold as slaves. Sidon and Tyre and, together with them, Phœnicia vanished from the world's history. Yet we hear of the cities again during the reign of the Ptolemies, and a certain amount of autonomy must have been given at least to Sidon and Tyre. Phœnician inscriptions tell of independent rulers in the fourth and third centuries B.C., notably in Sidon, where the family of Echmunazar ruled. In 197 B.C. Phœnicia came into the power of the Seleucid kings of Syria and became involved in the collapse of that Kingdom. In 64 B.C. it became with Syria a Roman province, and, although the trade of the seacoast towns was greatly benefited thereby, their Phœnician character was soon lost and forgotten.

The influence of Phœnicia, however, was not confined to the narrow coast strip of Syria. At an early date her merchants brought about a contact between the East and the West, which constituted an important factor in ancient history. These merchants, traveling through the Mediterranean, formed colonies wherever they went, and many of the place names along the African coast seem to show that Phœnicians became there the dominant factors.

Only some of the general features of Phœnician religion are known. Each town had its protecting deity, with whom a female consort was often associated. In many cases this god

was known simply as the Baal (i.e., lord) of the place. In others he bore a special name, such as Melkart in Tyre, Sakkun in Carthage. The Phœnician pantheon was quite large, though some of the names may be different designations applying to one deity. The most important of their deities were Adonai (Gk., Adonis, q.v.), worshiped in Byblos (his cult was also transferred to Cyprus); Eshmun, a sun god, worshiped at Sidon, Berytus, and Carthage, and in Cyprus; Melkart, worshiped at Tyre; Tanith, the great goddess of Carthage, who was often associated with a Baal, as was Astarte on the Phœnician mainland. Foreign gods were also easily admitted into this pantheon, e.g., the Syrian gods Reshef and Anat, the Egyptian Isis, Osiris, Bast, and Horus, and the Babylonian Hadad. A parallel to this is found in the general tendency of the Phœnicians to adopt the art, culture, and myths of the surrounding peoples. Their religion therefore presents a strangely conglomerate character. Traces of primitive conceptions which they shared with other Semitic peoples persisted to the latest period. Trees, stones, and rivers were regarded as sacred principles underlying the animistic stage of religious development. In early days the cult was carried on in groves or on the tops of mountains. In later times small sanctuaries were erected and inclosed in a sacred area. Subsequently, perhaps under foreign influence, more elaborate structures were erected, temples with a large altar in a court open to the sky, to which was attached a covered shrine, regarded as the holy of holies. The chief festival of the Phœnicians seems to have been the one which was celebrated at the time of the summer solstice, commemorating the death and return of Adonis. The priesthood must have assumed large proportions, but it does not seem to have wielded the power that the priesthood held in Egypt and Babylonia, though the ruler at times was chief priest also.

Bibliography. F. K. Movers, *Die Phönizier* (2 vols., Bonn, 1841-56); the fragments of Menander's "Annals of Tyre," in Cory, *Ancient Fragments* (ib., 1871); Meltzer, *Geschichte der Karthager* (Berlin, 1879, 1896, 1913); Richard Pietschmann, *Geschichte der Phönizier* (ib., 1889); George Rawlinson, *History of Phœnicia* (London, 1889); Friedrich Jeremias, *Tyrus bis zur Zeit Nebukadnezars* (Leipzig, 1891); Hugo Winckler, *Altorientalische Forschungen* (ib., 1893-1906); James Hastings, *Dictionary of the Bible*, iii, 855 ff. (New York, 1900); Winckler in H. F. Helmolt (ed.), *World's History*, vol. iii (Eng. trans., New York, 1902); Victor Bérard, *Les Phéniciens et l'Odyssée* (Paris, 1902-03); Wilhelm Landau, "Die Bedeutung der Phönizier im Völkerleben," in *Ex Oriente Lux*, vol. i (Leipzig, 1905). See GLASS.

PHENICIAN (fē-nish'an) ART. The art of the Phœnicians was both cosmopolitan and commercial. Their lack of originality and of artistic sense made it easy for them to turn their energies to copying the arts of their powerful neighbors, especially of Egypt and Assyria, and to cultivating those branches of art that were merchantable and transportable. They show the influence of the Hittite and other Syrian tribes in their magnificent fortifications and of the Iranians, perhaps, in their lack of monumental temples. A branch of their school in Cyprus developed monumental sculpture in stone under archaic Greek influence, and this

was echoed in the Phœnician settlements in Spain (e.g., Elche); but otherwise large sculptures in stone seem rare. It was otherwise with works in metal, from bronze to gold, and in terra-cotta, glass, iron, and textile objects. In all these branches the Phœnician artisan distinguished himself and supplied most civilized nations. It was after 1000 and before 500 B.C., when international commerce was almost exclusively in the hands of the Phœnicians, that this art was most brilliant and that we find its products in the tombs, palaces, and sanctuaries of nearly every country of the Mediterranean and of western Asia. Later the African branch, with its centre at Carthage, continued its history, even under Roman dominion, as is being brilliantly shown by Delattre's excavations.

Architecture. The eclecticism of the Phœnicians appears in their monuments. From the few surviving remains it would seem that Babylonian, Egyptian, Assyrian, and Persian influences alternated. The little temple of Amrith is thoroughly Egyptian, and so are the less important tabernacles at Ain el Hayat. The general scheme of the larger temples was a court in which the cella or tabernacle rose on a basement. The temples of Cyprus should be reckoned with those of Phœnicia, though they approach closer to the Greek type with columnar portico. Of the famous temples of Tyre, Sidon, Gebal, and Paphos nothing remains. Almost as thorough a destruction has overtaken the military and civil constructions by which the Phœnician cities were made almost impregnable. Something remains at Arvad, Berytus, Sidon, and at Eryx, in Sicily, in magnificent masonry that passes from the earlier polygonal and cyclopean to the later Hellenic course construction in stone. Thapsus alone has preserved part of its harbor constructions, so important in all Phœnician cities. As in the case of the Etruscans, we can learn something from the sepulchral architecture, both the free-standing specimens, like the circular monolith of Amrith with its guardian lions, and another at the same place in the form of a house with pyramidal roof, and the other type of rock-cut chambers, such as those of Carthage and nearly all the cities. The temple of Solomon at Jerusalem seems to have been in part of Phœnician design, especially the two bronze columns Jachin and Boaz and the bronze laver on its 12 oxen, but the Phœnician element appears in detail and execution, not in plan.

Sculpture and Minor Arts. The anthropoid sarcophagi, of which the Louvre possesses a number, while others, found at Sidon, are now in the Museum of Constantinople, show the influence of Egypt on monumental Phœnician sculpture. But the sarcophagi and statues found by Cesnola and others in Cyprus are by far the largest part of the Phœnician plastic patrimony. Here, even more than in Persian sculpture, we find that the Hellenic idea of letting the form of the body pierce through the drapery was adopted, and that the attempt at expressiveness took the form of the grimace or smile. There is a curious amalgamation in this school of such Hellenic elements with others from Egypt and Assyria, with the composition varying according to political predominance. Statues of gods and goddesses as well as of priests, sometimes colossal, show facility of execution. The sarcophagi, especially that from Amathus, are of equal importance and are in high relief, in contrast to the Assyrian low-relief technic.

In the field of metal work the most extraordinary objects that have been preserved are the great bronze votive shields from the cave of Zeus on Mount Ida in Crete, with their Egyptian sphinxes, Assyrian lions, and figures of Merodach and zones of animals like those on the early Greek vases (especially Corinthian). Equally important on a smaller scale are the silver dishes or pateræ found in Assyrian palaces (Nimrud), in Cyprus, and in some Italian tombs, with their exquisite scenes engraved or in relief, from mythology, legend, or daily life. The Dali cup in the Louvre, the Palestrina patera and those from Curium in the Metropolitan Museum, are the finest pieces of work preserved from Oriental antiquity. The mixture of subjects shows that the Phœnician artist cared less for the significance than for the artistic quality of the design and often made mistakes in copying scenes originally conceived by Assyrian or Egyptian artists.

The gold and silver ware on the tables of Oriental monarchs, their bronze serving vessels, were usually the work of these Phœnician artists, who were everywhere, even in Nineveh. It was not quite the same with ivories, only some of which are Phœnician. But, on the other hand, the Phœnicians absorbed nearly all the trade in glass vessels, after learning the art from Egypt, and the glass factories of Tyre and Sidon and Berytus remained famous even through the Middle Ages. The collection in the Metropolitan Museum (mostly from the Charvet collection, one of the finest in existence) contains many Phœnician pieces, and the tombs that are continually being opened in Phœnicia furnish more glass than any other class of objects.

It would seem as if in jewelry the Phœnicians played the important rôle of giving models to Greek and Etruscan artists after learning from Egyptian and Asiatic artists. Lotus flowers and anthemions, heads of Isis, of Hathor, and other gods and genii, animals and birds in relief or as pendants, rosettes and groups of bulls hanging from chains, formed most elaborate designs in earrings, necklaces, tiaras, etc. In the field of engraved stones, precious or rare, the Phœnicians imitated as usual; the Egyptian scarab and the Assyro-Babylonian cylinder and seal were equally popular, with borrowed mythological scenes, until, in the fourth century B.C., the fashion turned exclusively to Greek models.

Bibliography. The standard work of reference is Perrot and Chipiez, *History of Art in Phœnicia and its Dependencies*, translated by Walter Armstrong (2 vols., New York, 1885); but this may be supplemented for architecture by Ernest Renan, *Mission de Phénicie* (Paris, 1865-74); by C. E. L. W. Fröhner, *La verrerie antique* (Le Pecq, 1879), for the Charvet collection of glass; by Joachim Ménon, *La glyptique orientale* (Paris, 1883), for engraved gems and stones; by Charles Clermont-Ganneau, *L'imagerie phénicienne* (Paris, 1880), for the silver pateræ; by Orsie Halbherr, *L'antro di Zeus in Creta* (Rome, 1883), for the Phœnician shields, etc. See GLASS.

PHœNICIAN LANGUAGE. The language spoken by the inhabitants of Phœnicia. It belonged to the Hebrew-Phœnician division of the Semitic family of languages and represents in general an archaic stage of Hebrew and Moabitic, although it differs from the North Semitic group in certain particulars, such as having

tan (like the Arabic *kāna*) for the copula instead of *haya*, as in Hebrew. Phœnician spread widely from its home as Punic colonies were founded in the islands of the Mediterranean and Aegean, in southern and western Asia Minor, southern France, and especially in northern Africa. The diffusion gave rise to variations both of dialect and script, which were, however, comparatively slight. The sources of our knowledge are the inscriptions on tombs, votive tablets, coins, seals, etc., the transliteration of Phœnician phrases in Plautus's comedy of the *Pœnulus*, and the proper names and words found in the Old Testament, in the inscriptions of Assyria and Egypt, and in classical writers. The inscriptions are by far the most important source. Although they are very numerous, the vocabulary is relatively scanty on account of their monotonous content. They cover the period from about 600 B.C. to 200 A.D. The longest are the inscriptions found upon the sarcophagus of King Eshmunazar at Sidon in 1855 of 22 lines, at Marseilles in 1845 of 21 lines, and at Larnaka in 1879 of 29 lines. The passage in the *Pœnulus* and the words and names in other foreign sources are of value in fixing the vocalization and pronunciation of Phœnician, since the alphabet, like all the Semitic scripts, excepting the Assyro-Babylonian and Ethiopic, writes only the consonants. The alphabet, which itself seems derived from the South Arabian script, is of importance as the ancestor of the Græco-Roman family of alphabets. (See PLATE of ALPHABETS.) The Neo-Punic language, which lasted in some measure till the fifth century A.D., shows important deviations from the older Punic that existed at Tunis and east Algeria. St. Augustine, who was practically a Carthaginian, states that Punic is closely related to Hebrew. Phœnician literature seems to have been very scanty, consisting chiefly of annals, and at least one work, by Mago, on agriculture, and has been entirely lost with the exception of Greek translations of the voyage of Hanno (q.v.) and fragments asserted to be translations of the histories of Sanchuniathon (q.v.). See SEMITIC LANGUAGES.

Bibliography. H. F. W. Gesenius, *Scripturae Linguaeque Phœniciae Monumenta Quotquot Superant Edita et Inedita* (3 vols., Leipzig, 1837); Paul Schröder, *Die phönizische Sprache* (Halle, 1869); *Corpus Inscriptionum Semiticarum* (Paris, 1881-87), continued by the *Répertoire d'épigraphie sémitique* (ib., 1888 et seq.); Bloch, *Phönizisches Glossar* (Berlin, 1891); Mark Lidzbarski, *Handbuch der nordsemitischen Epigraphik* (Weimar, 1898); Wilhelm Landau, *Beiträge zur Altertumskunde des Orients* (Leipzig, 1899-1906); id., *Die Phönizier* (ib., 1901); G. A. Cooke, *Textbook of North-Semitic Inscriptions* (Oxford, 1903), containing translation and notes; Mark Lidzbarski, *Altsemitische Texte* (Weimar, 1907).

PHœNISÆ (Lat., from Gk. *Φοινισαί*, *Phoinissai*, Phœnician Women). A play by Euripides, so called from its chorus of Phœnician captives at Thebes. The myth which forms the subject of the play is the same on which the *Seven against Thebes* is based.

PHœNIX (Lat., from Gk. *φœνιξ*, *phœnix*). The name of a mythical Egyptian bird frequently mentioned by classical writers. Herodotus (ii, 73), who says he heard the story at Heliopolis and saw a picture of the bird there, relates that the phoenix, on the death

of his father, embalms the body in an egg made of myrrh and every 500 years conveys it from Arabia to the temple of the Sun at Heliopolis. According to Pliny (*Nat. Hist.*, x, 2), there is only one phoenix at a time, and when he perceives that his end is near, he builds in Arabia a nest of twigs of cassia and frankincense and dies upon it. From the body is generated a worm which develops into the new phoenix. The young bird then conveys his father's body to Heliopolis and burns it upon the altar there (Tacitus, *Ann.*, vi, 28). According to Horapollon (ii, 57), the phoenix casts himself upon the ground and receives a wound, from the ichor of which springs his successor. But the most familiar version of the birth and death of the phoenix is that given by the *Physiologus*, in which the bird burns itself upon a nest or pyre of odoriferous woods and the young phoenix springs from the ashes. The interval between the bird's appearances at Heliopolis is variously stated; the period usually named is 500 years, but 1461 and 7006 years are also given. According to Tacitus (*Ann.*, vi, 28), the phoenix appeared four times in Egypt: (1) under Sesostris (q.v.), (2) under Amasis II, (3) under Ptolemy III, and (4) in the year 34 B.C.

In Greek and Roman art it was common to represent the phoenix as an eagle; but by the Egyptians, who called it *dennu*, the bird was depicted as a heron with two long feathers growing from the back of its head and sometimes with a tuft hanging from its breast. It symbolized the morning sun rising out of the glow of dawn, and hence it was looked upon as the sacred bird of the sun god Ré. It also represented the new sun of to-day springing from the body of the old sun of yesterday, which had entered the lower world and become one with Osiris. Hence the phoenix or *dennu* was regarded as a manifestation of Osiris and became a symbol of the resurrection, continuing to serve as such even in early Christian times. It has been supposed by some scholars that the phoenix is mentioned in Job xxix. 18 and Ps ciii. 5, but the identification is very doubtful. Consult: Kirchmayer, "On the Phoenix," in *Collectanea Adamantæ*, vol. ii (Edinburgh, 1886); K. A. Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); id., "Die Phoenix-Sage im Altenägypten," in *Zeitschrift für ägyptische Sprache*, vol. xvi (Leipzig, 1878); E. A. T. Wallis Budge, *The Gods of the Egyptians* (2 vols., Chicago, 1904).

PHOENIX, or **PHENIX**. A city in Lee Co., Ala., on the Chattahoochee River, opposite Columbus, Ga., and on the Central of Georgia Railroad (Map: Alabama, D 3). It is a residential place and is also of considerable importance as a commercial centre. The industrial establishments include a lumber mill and coffin, cigar, and mattress factories. Among the chief buildings are the city hall and two fraternal society halls. Settled about 1860, Phoenix was first incorporated in 1883. The water works are owned by the city. Pop., 1900, 4163; 1910, 4555.

PHOENIX. A city, the county seat of Maricopa County and the capital of the State of Arizona, 150 miles by rail northwest of Tucson, on the Maricopa and Phoenix and the Santa Fe, Prescott, and Phoenix railroads (Map: Arizona, C 4). Among the more prominent features are the capitol, Agricultural Experiment Station,

Federal Building, Arizona School of Music, city hall, Carnegie library, courthouse, and splendid high-school and central-school buildings. The city is a popular winter resort. Points of interest near by are the ruins of the Aztec Community Houses, Hieroglyphic Rocks, Indian Mounds, and Cactus National Park. Phoenix has extensive commercial interests, controlling an important trade in live stock, grain, fruits, ostriches, hay, honey, and olives. There are also considerable mining interests. Settled in 1870-75, Phoenix was incorporated in 1881, the charter of that year being revised again in 1893. In 1913 the commission form of government was adopted. The city owns the water works. Pop., 1890, 3152; 1900, 5544; 1910, 11,134; 1915 (U. S. est.), 17,798.

PHENIX, JOHN. See DEERY, GEORGE HORATIO.

PHENIX PARK. A public park in Dublin, containing a granite monument in honor of Wellington. The park became famous through the assassination within its borders, on May 6, 1882, of Lord Frederick Cavendish, Chief Secretary for Ireland, and Thomas Burke, the Undersecretary.

PHOENIXVILLE. A borough in Chester Co., Pa., 28 miles northwest of Philadelphia, at the junction of French Creek with the Schuylkill River and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, K 7). It has a Carnegie library and a hospital and is an important manufacturing centre, well known for its great iron and steel mills, boiler works, silk mill, underwear and hosiery factories, and a match factory. The government is vested in a burgess, chosen triennially, and a council, which elects all municipal officials excepting the school directors, who are independently chosen by popular vote. The borough owns and operates the water works. Phoenixville was settled in 1732 and was incorporated as a borough in 1849. Pop., 1900, 9196; 1910, 10,743; 1915 (U. S. est.), 11,557.

PHOLAS (Neo-Lat., from Gk. *φωλὰς*, a lurking mollusk which makes holes in stones). A genus of bivalve mollusks having much roughened, filelike shells with which they excavate cavities in soft rocks, in other shells, etc., for their own occupancy. See DATE SHELL, and Colored Plate of CLAMS.

PHOLUS. A centaur, son of Silenus, by whom Hercules was entertained on his journey in quest of the Erymanthian boar. When the other centaurs were attracted to the cave of Pholus by the odor of the wine with which he regaled the hero, Hercules scattered and pursued them, but on his return found Pholus accidentally killed by one of the arrows which he had withdrawn from the body of a slain centaur and which had dropped from his hand and stuck in Pholus's foot.

PHONAUTOGRAPH, fôn-â'tô-graf. See MELOGRAPH.

PHONENOSCOPE (from Gk. *φωνή*, *phonē*, voice + *ἐνδον*, *endon*, within + *σκοπεῖν*, *skopein*, to examine). An instrument used in auscultation of the heart and lungs in the same manner as a stethoscope. It consists of a shallow metal cup to which are attached rubber tubes fitting into the ears and covered by a disk or diaphragm of ebonite. From the centre of the disk springs a small rod terminating in a button. This button is placed upon the area to be examined, and the tubes are fitted into the ears of the

examiner. The instrument is much more delicate than a stethoscope and is of particular value in distinguishing between endocardial and pericardial murmurs.

PHONETIC LAW (Gk. φωνητικός, *phōnētikos*, relating to sound, from φωνή, *phōnē*, sound, voice; connected with φῆναι, *phēnai*, Lat. *feri*, to speak, OHG. *ham*, Ger. *Bann*, AS. *bann*, Eng. *ban*). In comparative linguistics, a formula which sums up a certain phonetic correspondence or a certain number of such correspondences. The term "law" in this sense is therefore essentially different from its application in mathematics or chemistry and approaches rather the usage of the word as it is employed in psychology. A given phonetic law, moreover, is required to be operative only under given conditions in a given dialect or dialect group during a given period. As an example of such a law we may take the representation of the Indo-Germanic *ā* which becomes in Germanic *ō*, which remains unchanged in Gothic, Icelandic, Old Saxon, and Anglo-Saxon: as Skt., *bhrātar*, Gk. φράτηρ, Lat., *frāter*, brother, but Goth. *brōthar*, Icel. *bróðhēr*, OS. *brōdhar*, AS. *brōdhar*. Further, it is a phonetic law in Old High German that such an *ō* becomes *uo*, which is changed in New High German to *u*, so that we find corresponding to Goth. *brōthar*, OHG. *bruoder*, NHG. *Bruder*. On the other hand, Indo-Germanic *ā* becomes *a* in Old Church Slav and *o* (written *o*) in Lithuanian; as Skt. *bhrātar*, brother, OChurch Slav. *bratrŭ*, Lith. *brolis*. As the science of comparative linguistics developed, it was found that sound changes followed certain rules. The very earliest investigators, however, seem to have paid little attention to the problem whose enunciation and discussion was destined to mark an epoch in the history of the science, the question as to the invariability of phonetic law. Yet even then it was realized that etymology (q.v.) without strict adherence to phonetic law was capricious and unscientific. The existence of such law was emphasized by the famous discovery known as Grimm's law (q.v.), which was in its turn supplemented and accentuated anew by the enunciation of Grassmann's law (q.v.), Verner's law (q.v.), and the palatal law, which postulated the existence of *e* in Pre-Indo-Germanic. In 1876 the logical result of phonetic investigations up to that time was given by Leskien, when he stated the theorem that phonetic laws know no exceptions. This was the keynote of the neogrammarian movement. (See PHILOLOGY.) Osthoff and Brugmann two years later stated the principle in its definite form as follows: "All sound change, in so far as it operates mechanically, is carried out according to invariable laws." By this modification of Leskien's statement the necessary scope was given for analogy (q.v.) in converting the action of the laws. Exceptions were therefore only apparent, not real, and they were to be explained either by the operation of analogy or as the results of laws yet undiscovered. This latter point had already been emphasized by Leskien, as Whitney had laid stress on the importance of analogy in explanation of many difficult linguistic phenomena. The point at issue was unfortunately shifted, and the gulf between the old and the new schools of grammarians widened almost hopelessly. The contention became, not the nature of phonetic law, wherein, it would seem, all might be in harmony, but whether the laws were invariable

or not—a problem which is yet unsolved. Without going into the details of the long discussions which followed after 1878, where Georg Curtius and Brugmann were the protagonists for the old and the new schools respectively, it may be said that the net result has been a distinct gain for the neogrammarian movement. Phonological and etymological investigation at present tacitly accepts the invariability of phonetic law. At the same time it is not as rigidly bound by dogmatic adherence to this principle as was the case when the enthusiasm of its novelty was potent. The influence of the doctrine has, then, been most beneficial in enforcing accuracy in the application of the laws and compelling exact and full explanation of any deviation, however slight, from their normal action. On the other hand, sufficient attention has not yet been devoted to the explanation of the laws themselves. Why, e.g., to revert to the example already given, does Indo-Germanic *ā* become *ō* in certain languages, *a* in others, and in others still remain unchanged? Phonetic changes, instead of being absolutely invariable, are only relatively uniform and obey only general tendencies. These tendencies are governed to a large extent by physiological requirements and further by psychological processes, especially the associative faculties of analogy, imitation, and the like. Initially the changes are individualistic. If the phonetic change in question is physiologically possible and pleasing to a speech community, however small, it may be adopted imitatively and may then be extended analogically, and, being accepted by a widening range of speakers, it may develop into a general tendency, become relatively uniform, and thus be made a phonetic law. These conclusions are confirmed by the study of living, spoken dialects, where the artificial uniformity of script does not mislead the investigator, as is too often the case with languages that have been preserved only in literary forms. See GRASSMANN'S LAW; GRIMM'S LAW; PHILOLOGY; PHONETICS; VERNER'S LAW.

Bibliography. Georg Curtius, *Zur Kritik der neuesten Sprachforschung* (Leipzig, 1885); F. K. Brugmann, *Zum heutigen Stand der Sprachwissenschaft* (ib., 1885); Schuchardt, *Ueber die Lautgesetze* (Berlin, 1885); Brugmann and Delbrück, *Grundriss der vergleichenden grammatik der indogermanischen Sprachen* (2d ed., 3 vols., Strassburg, 1897-1913); H. G. C. von der Gabelentz, *Die Sprachwissenschaft* (2d ed., Leipzig, 1901); Hanns Oertel, *Lectures on the Study of Language* (New York, 1901); Van Ginneken, *Principes de linguistique phonétique* (Paris, 1907); Berthold Delbrück, *Einführung in das Studium der indogermanischen Sprachen* (5th ed., Leipzig, 1908, Eng. trans. of 1st ed. by E. Channing, ib., 1882); Hermann Paul, *Prinzipien der Sprachgeschichte* (4th ed., Halle, 1909); F. N. Finck, *Die Sprachstämme des Erdkreises* (Leipzig, 1909); id., *Die Haupttypen des Sprachbaues* (ib., 1910); Antoine Meillet, *Introduction à l'étude comparative des langues indo-européennes* (3d ed., Paris, 1913); Leonard Bloomfield, *Introduction to the Study of Language* (New York, 1914).

PHONETICS. In its broadest sense, a study of the whole range of sounds, articulate, musical, and otherwise. It is, however, usually confined to the articulate sounds of human speech. Even in this restricted sense it is still broad enough to include the subject of the acoustic or me-

chanical side and the anthropological or philosophical side. It may discuss simply the speech vibrations that cause any particular sensation on the human ears, or it may include an investigation of the manner and causes of the changes the articulate sounds of a language undergo as it develops. In the first case it should consider the mechanism and methods by which the sounds are produced and also the way in which they are made effective in the ear and impress the brain.

The variations of articulate sounds and the symbols which from time to time may be used to represent them constitute questions that are frequently treated under comparative philology (q.v.).

Confining the attention to what may be called the acoustics or physics of phonetics, the subject naturally falls under three heads: What is tone quality, or the mechanical difference between two sounds? How are sounds produced in the human voice? How are they perceived in the ear? The divisions may best be treated in the order given.

One sound differs from another in three factors, pitch, intensity, and quality. (See ACOUSTICS.) The pitch and intensity, or loudness, are of but little importance in this connection. The controlling factor is the quality. In articulation the sounds are divided into two broad classes: the vowel sounds, or those which are essentially modifications of vibrations set in motion by the larynx, as will appear later; and the consonants, or those sounds that are more essentially a peculiar stopping or starting of a vowel sound and are apt to form the transition from one vowel to another, by some one of an infinite variety of ways.

Taking up the discussion of the vowel sounds first as being the simpler case, it is evident that these sounds, which last with a uniform character for an appreciable fraction of a second or at least may be so prolonged, must depend for their distinguishing peculiarities upon the same factors as any other sound. As the pitch of a sound depends upon the length of the wave, and the intensity upon the height of the wave, so does the quality of the sound depend upon the shape of the wave. It has been demonstrated that any wave motion, no matter how complex, may be considered as made up of a series of simple waves of differing lengths and heights. Therefore any quality of sound, no matter how complex, must be composed of simple components, differing in pitch and intensity. By a simple sound is meant one in which the vibrating particles move in a simple harmonic motion, similar, e.g., to that executed by a pendulum. When a violinist plays a particular note, it differs from the same note on the organ or the piano or the wind instruments only in the relative number, intensity, and pitch of the partials or overtones which accompany the fundamental or pitched tone. In a manner entirely analogous, the vowel sounds of the human voice differ one from another, when the same fundamental tone is being produced, only in the relative number, pitch, and intensity of the accompanying partials. It is believed by some that the phase relation of the components affects the quality of the sound also, but this is still an open question and certainly does not affect the case of articulation.

The question, then, is to determine just what are the particular combinations of elements which

form the various vowel sounds. In the first place, it has been shown conclusively that the same relative components will not produce the same vowel sounds on different pitches. For example, a certain combination, bearing a definite relation to a fundamental of 256 vibrations a second, will produce a certain vowel quality, but if the rates of all these components are raised by the same interval of a fifth the vowel quality will be quite different. In other words, that combination which is recognized as giving a perfectly satisfactory *a*, as in *father*, on a pitch of middle *c*, is entirely different from that which is similarly recognized on a pitch an octave higher.

There are two theories at present as to what constitutes the essential characteristic of a particular vowel sound. Some hold that each vowel sound always contains in its complex a certain characteristic tone component of definite pitch and that the presence of this element makes that vowel. For example, *a*, as in *father*, has its essential vowel tone; the vowel of *meet* would have a different tone. This theory holds that the pitch of the characteristic elements is constant, irrespective of the pitch of the fundamental, or main tone. Others believe that there is no difference in the question of tone quality in vowels from the same question as applied to any tone. Under this conception there would be no one essential component, but all would be essential and the total would be characteristic. This would mean that the difference between *o* and *a* pronounced on treble *c* is of exactly the same character as that between the two sounds when that note is played on a flute and on a violin. In other words, vowel quality is not different from tone quality.

The actual solution of this question is enormously complicated by the fact that habit allows the greatest possible variation in what may still be called a particular vowel. For example, the *a* in different individuals may differ more radically than the *a* and *o* in the same individual.

Helmholtz, Rousselot, and numerous other scholars attempted to determine the pitch of the characteristic tones of the vowels. No two of these scholars agree; hence it is not surprising that the greatest difference of opinion exists as to the exact pitch of the characteristic tone and also as to the particular combination of partials which form the particular vowel sounds. In general it seems well established that in the sound of *a*, as in *father*, the complex consists of the fundamental and the first 8 or 10 overtones with intensities decreasing as they rise in pitch. The vowel in *meet* has not the higher overtones and is characterized by a relative strengthening of the third and fourth in the series. *O*, as in *moat*, has number four rather strong; and finally *u* in *boot* is little if anything besides the fundamental and a little of the first overtone. Further than this, we are not safe in going at the present stage of research. It is to be understood that these overtones are in the series present in a string or an open pipe; i.e., the rates of vibration of the fundamental and overtones are in the ratio of 1 to 2, 3, 4, 5, etc.

The question of the exact composition of any vowel on any pitch cannot be definitely and finally determined, for the simple reason that the character of the sound differs with every individual, and no one can be said to be right and all the others incorrect. Specific analyses

in particular cases can of course be given, but general conclusions should be stated only with caution.

As to the quality of the sounds of the consonants little can be said at present, as the case is much more complex than that of the vowels. On the one hand the quality is rapidly changing from instant to instant, thus offering new and special difficulties to the analyst; and on the other hand the simple more or less musical tones are often accompanied by a number of irregular noises like the hiss, the aspirate, etc. There are also the peculiar methods of stopping and starting the sounds, as in *p*, *b*, *d*, *g*, etc.

Thus far no rigid analysis of the consonants has been possible from the standpoint of acoustics or physics, although the individual variations may be less than in the vowels.

The second branch of the subject is the apparatus and method of production of human articulate sounds. This function is performed by the joint action of the lungs, larynx, mouth, and nose. The lungs are simply the bellows and serve to supply the air to actuate the vocal cords and thus produce the various sounds; they supply the raw material and are the source of energy.

In the larynx (q.v.) is to be found the original source of all the sustained sounds that bear any resemblance to musical tones. Whispersings, hisses, aspirates, etc., are formed independently of the larynx. In the larynx is to be found a pair of cords or membranes, which may be so drawn together over the top of the windpipe that they virtually close it. If air from the lungs is forced against the cords under the above conditions, they may be set into vibration and produce a sound. The pitch of this sound is regulated by the length, weight, and tension of the cords, there being present in the larynx sets of muscles for the involuntary control of these three factors which determine the pitch of a vibrating cord. Confining the attention again to the vowel sounds, it may be said that the principal function of the larynx is to produce a sound which can be molded into any one of the vowels, but that its action is not determinative as to which vowel shall be produced. Articulation is not performed by the larynx, but by the agencies between it and the outer air. The particular variation of tone that is produced by an individual depends upon the cavities of the mouth and nose, the position of the various movable parts, as the tongue and palate, and the size and shape of the opening at the teeth or lips. In the flute and the clarinet it is the number and location of the openings that determine the pitch to a large extent; but in the human voice it is the larynx which determines the pitch of the fundamental, while the size, shape, and openings of the cavities of the mouth and nose determine the quality of the sound, i.e., the vowel sound produced. Resonance as applied to this subject means that property of a mass of air by virtue of which it can pick up and intensify the vibrations which fall upon it when these vibrations are of a frequency bearing the proper relation to the size, shape, and opening of the air mass. The vocal cords produce a complex sound composed of a fundamental and a more or less complicated series of overtones; this sound passing out through the cavities of the mouth and nose has certain tones reinforced by virtue of the resonance of the cavities, while other compo-

nents are virtually smothered, from finding no means of reinforcement.

Cases are on record where the whole larynx has been removed and a silver one substituted, so arranged that a simple reed could be inserted, and the patient could articulate just as well as before, with the sole difference that he spoke always on the same fundamental pitch. Individual or race peculiarities of pronunciation may, of course, be largely owing to peculiarities in the dimensions and character of the vocal cords and larynx, as well as to the cavities of the mouth and nose, etc.

The third and last element to be considered under the physics of phonetics is the sound-receiving apparatus of the human being, the ear (q.v.).

In the history of phonetics for the past century two movements require comment—the so-called English school of phonetics, and experimental (or instrumental) phonetics. Alexander Melville Bell (q.v.) is considered to have given an impetus to the English school when, in 1867, he published *Visible Speech*. Bell contrived a cumbersome and really absurd alphabet in which the form of the letter indicated the position of the pertinent organs of speech. One result of Bell's work was a close study of the positions and actions of the organs of speech, especially of the tongue and lips. His work and alphabet were perfected by a group of patient observers, chief among whom was Henry Sweet. Under his guidance the English school assumed a large mass of doctrine, together with a terminology which must be called pseudoscientific, at least in large part. None the less the tenets and the terminology of the school spread abroad, first to Scandinavia, the United States, and France, then to Germany, Italy, and Spain. The English school has been dominant, the world over, for more than a quarter of a century, except in so far as it has had to divide the honors with experimental phonetics. See DEAF MUTE; VISIBLE SPEECH

The origin of this great modern movement in phonetics may be traced to a committee appointed in 1874 by the Société Linguistique de Paris to report on the possibility of studying the phenomena of speech by means of instruments. Louis Havet was the leading spirit of the committee. He received aid and encouragement from the ingenious master, Etienne Marey, at whose laboratory he met Dr. Rosapelly, a physician of Paris, who contrived several of the instruments used in the research. It was in 1885 that the Abbé Rousselot, acting on a hint of Gaston Paris, conceived the idea of applying instruments to the study of sounds of speech. In time he learned of the experiments of Louis Havet's committee, was guided by Dr. Rosapelly and Charles Verdin, and began to publish in 1891. He was destined to be considered the founder of the "new science," and his laboratory at the Collège de France has long been the best and most famous in the world. The experimental method spread rapidly. In the United States work in this line was done as early as 1890 by E. S. Sheldon, C. H. Grandgent, and Raymond Weeks, who were followed later by F. M. Josselyn, E. W. Scripture, and others. The development of the experimental method in phonetics has paralleled that of the same method in psychology. At present instruments exist for recording, among other things, the vibrations of the larynx, the movement of

the soft palate, that of the lips, that of the lower jaw, the points of contact of the tongue against the palate, the air pressure measured from within the mouth or from the lips.

A final word concerning phonetic alphabets. Hundreds of such alphabets have been proposed, but the only one that has made progress and that bids fair to become general (of course, with modifications) is that of the Association Internationale Phonétique. This alphabet took form between 1885 and 1889, in the hands of Paul Passy. He adopted several letters from A. J. Ellis, the author of *Early English Pronunciation*, and profited from the notations of Bell and Sweet. He founded the *Maitre Phonétique* in 1889, and this influential journal appears entirely in the dress of the International Phonetic Alphabet.

Bibliography. A. J. Ellis, *Early English Pronunciation* (London, 1869-89); A. M. Bell, *Visible Speech* (2d ed., ib., 1882); Paul Passy, *Etude sur les changements phonétiques et leurs caractères généraux* (Paris, 1890); Jean Rousselet, *Modifications phonétiques du langage* (ib., 1891); G. E. Sievers, *Grundzüge der Phonetik* (5th ed., Leipzig, 1901); Jean Rousselet, *Principes de phonétique expérimentale* (2 vols., Paris, 1901-08); E. W. Scripture, *Elements of Experimental Phonetics* (New York, 1902); Otto Jespersen, *Phonetische Grundfragen* (Leipzig, 1904); E. W. Scripture, *Researches in Experimental Phonetics*, published by the Carnegie Institution (Washington, 1906); Henry Sweet, *Primer of Phonetics* (3d ed., Oxford, 1907); id., *The Sounds of English* (ib., 1908); Daniel Jones, *The Pronunciation of English: I, Phonetics; II, Phonetic Transcriptions* (Cambridge, 1909); A. M. Bell, *Sounds and their Relations* (3d ed., Washington, 1910); Léonce Roudet, *Éléments de phonétique générale* (Paris, 1910); Théodore Rosset, *Recherches expérimentales pour l'inscription de la voix parlée* (ib., 1911); Paul Passy, *Petite phonétique comparée des principales langues européennes* (2d ed., Leipzig, 1912); Otto Jespersen, *Lehrbuch der Phonetik* (2d ed., ib., 1913); Laura Soames, *Introduction to English, French, and German Phonetics* (3d ed., London, 1913).

PHONETIC SPELLING. Spelling according to sound. See ORTHOGRAPHY; SHORTHAND; SPELLING REFORM.

PHONETIC WRITING. Writing according to sound. In the case of languages which have not previously been reduced to writing and thus acquired a stereotyped orthography, phonetic writing is necessarily regularly employed. In this way many Polynesian, African, and American Indian dialects have received a written form. In languages that already possess an established orthography phonetic writing is employed either in shorthand or in so-called spelling reform. In the former case the phonographic shorthand signs are afterward transliterated into the conventional orthography. In the latter instance the sound as heard by the writer is preserved at the expense of the etymology and very frequently of consistency, the same word often being variously written in phonetic spelling by different writers, and with a more or less cumbersome system of arbitrary diacritical letters. In indicating the exact pronunciation of words whose orthography does not represent the sound, some exact system of phonetic writing is usually employed. At present the most commonly used system of signs is that adopted by the International Pho-

netic Association (*Association Internationale Phonétique*). See INTERNATIONAL LANGUAGE; ORTHOGRAPHY; PHONETICS; SHORTHAND; SPELLING REFORM.

PHONOGRAPH (from Gk. *φωνή*, *phōnē*, sound, voice + *γράφειν*, *graphein*, to write). The first mechanical device for the registering and reproduction of speech or other sound was the invention of Leon Scott, known as the phonautograph and constructed in 1855. It consisted simply of an ellipsoidal barrel. In this apparatus the sound receiver was open at one end and closed at the other. From the closed end projected a small tube, across which was stretched a flexible membrane, to the centre of which by means of sealing wax was affixed a bristle, which acted as a stylus and vibrated with the membrane. In front of the membrane was placed a horizontal cylinder, which was wrapped with a sheet of paper, covered with a thin layer of lampblack, against which the bristle rested lightly. Any sound vibrations entering the ellipsoid were transmitted by the membrane to the stylus, which, when the cylinder was made to revolve and to advance slowly, described on the lampblack surface a wavy line which was thus practically a phonographic record of whatever vibrations had been produced.

It occurred to Charles Cross in France that a metal record of the wavy line traced on the lampblack could be made by photo-engraving, and on April 30, 1877, he deposited with the French Academy of Sciences a sealed packet in which this idea was described, but he made no effort to reduce it to practice. In the meantime the invention of Leon Scott had been realized in useful form as a piece of laboratory apparatus by the eminent physicist and instrument maker König of Paris and was familiar to students of acoustics. It embodied the essential principles on which sound recording and reproducing instruments of the present day are based; but nothing practical was accomplished until 1877, when Thomas A. Edison (q.v.) constructed a machine in which a receiving funnel was substituted for the ellipsoid, an iron diaphragm for the membrane, a sharp metallic point for the bristle, and a tin-foil-covered cylinder for that coated with lampblack. There was, however, the essential difference that the sound vibrations were now indented rather than traced on the surface of the cylinder. By reversing the machine—i.e., by causing the stylus to travel over the spiral line indented by the recording point—the original sound was reproduced by the diaphragm. Mr. Edison at this time also filed patents for a disk phonograph, but did not put this idea into practice until many years afterward, when disk machines long had been manufactured by other persons.

The wonder and novelty of this invention roused great excitement and interest at the time, and very sanguine expectations of its future utility were held. Mr. Edison saw its possibilities and enumerated in the *North American Review* in 1875 a number of applications, several of which it may be said took many years to realize; and in fact one of these, the use in connection with the telephone to record conversation, was not perfected until 1914. (See TELESCRIBE.) The chief reason why the phonograph of those days did not realize immediately the hopes of its inventor and promoters was because, after a few repetitions, the record was effaced from the tin foil so that the instrument

was an interesting scientific toy rather than one of practical utility. Owing to the preoccupation of Mr. Edison with other inventions, the phonograph lay dormant, but in 1885 Bell and Tainter invented the graphophone (q.v.), wherein a wax cylinder was used for the record and an up-and-down line was cut rather than indented in the wax. In 1887 was patented the gramophone (q.v.) of Emil Berliner, wherein the sound vibrations of a diaphragm were recorded on a disk as a wavy line in a horizontal plane instead of as a vertical cut made in a cylinder. This line was traced in a continuous spiral, there being no screw for advancing the recording and reproducing element of the instrument.

In 1888 Mr. Edison, who by this time had returned to the consideration of the phonograph, perfected and placed on the market a commercial machine which was far more elaborate as well as more practical than its predecessor. The tin foil had given place to a wax cylinder which was slipped on and off a central mandrel on which it was revolved by an electric motor, while separate recording and reproducing devices were developed, wherein a glass diaphragm was used for recording and one of mica for reproducing. The cutting stylus connected with the under-surface of the glass diaphragm and vibrating in unison with it had a cup-shaped sapphire point ground to a fine edge, and the reproducing stylus carried by the mica diaphragm was also pointed with sapphire, but was ball-shaped so that it would follow the minute cut or groove traced by the recording point and communicate the corresponding movement to its diaphragm, in both cases the stylus being advanced along horizontally.

From these fundamental inventions modern appliances for reproducing sound have been developed, and various trade and other names have been applied to the different machines by their manufacturers. "Phonograph" has been used for all classes of sound-reproduction machines, though strictly it applies only to those developed by Edison and his associates. Some persons have desired to restrict the term "phonograph" to cylinder machines and reserve that of "gramophone" for those using disks, but this has been complicated by the manufacture of later Edison phonographs using disks for records. The term "talking machine" is used also; but as the reproduction not only of vocal but of instrumental music is one of the leading functions, this is naturally inadequate. In short, it is rather usual to apply the special trade name where the more general term "phonograph" is not used.

Each of the early machines mentioned was immediately developed by its inventors and indeed in many cases by those with scarcely less genius who became associated with them; and each in a way contained essential elements now seen in the modern instrument for reproducing sound and early adopted where not patented or patentable, or after the expiration of patents. Thus, the employment of wax as the medium for the record first used in the graphophone was soon utilized in the phonograph and gramophone, while the spring-driven motor took the place of the hand crank and, for most machines, the electric motor.

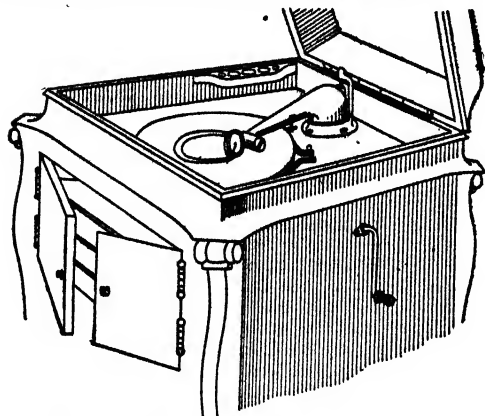
As a means of recording sound for reproduction in the general interchange of ideas or intelligence, the phonograph was slow in commending itself to favor; but as a means of re-

producing for amusement music, songs, speeches, recitations, etc., it soon established itself. In 1897 the manufacture of disk records began in the United States for instruments which were sold only for reproduction, as distinct from those available also for recording; and straightway the manufacture and sale of these records became an important and recognized industry, as the accompanying statistics testify. The cylinder machines, after they had been put on a practical basis, naturally had developed into commercial dictating machines later to be known as dictaphones or dictographs, for use in commercial letter writing and correspondence and especially for typing letters without the medium of stenography, for instruction in languages, and for obtaining permanent vocal records available at any time for reproduction. These functions at first did not secure general or wide acceptance, and the extent of use of the cylinder machines was rather limited in comparison with the amusement possibilities of the disk machines with their unending supply of new records of popular songs and other music as well as droll stories and recitations, which soon gained for them a profitable vogue. This led the manufacturers of cylinder machines to realize that they too were available for amusement purposes, and special machines of this kind were placed on the market, as well adapted for use in public places where by depositing a coin they could be heard in operation for a limited time. Difficulties were involved in the wholesale manufacture of cylinder records that had not been experienced by those making disk machines, though they too had had their years of ceaseless effort and costly experimenting to develop their product to a point of efficiency; but Mr. Edison found that, by gold-plating the original wax record and then by backing up the film of gold with copper, he was able to make a matrix from which any number of commercial records could be made speedily and accurately.

Naturally the manufacture of records became a vast industry, and endless care is required to maintain an ever-improving standard that will represent adequately good musicians or the more popular music as rendered by band, orchestra, or individuals. Not only musically and acoustically are the greatest pains required, but in the material and the methods employed the highest technical skill must be used with almost incredible refinements. Thus, the inability to secure certain pure chemicals from Germany after the outbreak of war in 1914 threatened to embarrass the Edison works until their own chemical laboratories were so arranged as to be able to supply the necessary materials of suitable purity.

In making the familiar disk records the laboratory is arranged to secure the best possible acoustic results. If a number of musicians are employed, they are so arranged about the horn of the recording instruments that the sound is concentrated or blended as desired. A special wax composed of stearin and paraffin is used for the disks, and when the record is duly made it is electrotyped with copper and then with nickel in order to give it a hard wearing surface. For the records to be used on the machines also, the material must be carefully selected and the disk itself made so that it not only will take properly the impression of the matrix, but also will be durable and wear well under the needles. It is made of shellac, wood charcoal, barium sulphate,

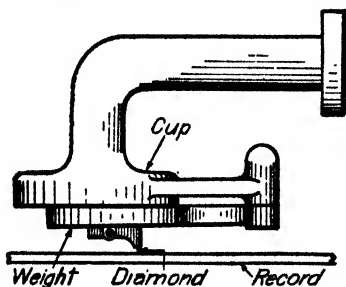
and earth-coloring matters. The matrix is heated and then placed in the warm plastic material, where it is pressed, cooling plates for both halves of the matrix being applied so that



VICTROLA SHOWING WOODEN CABINET WITH RESONANCE BOX FOR STRENGTHENING THE SOUND.

the mixture hardens quickly and can readily be removed.

It is obviously impossible to discuss the various refinements that have been introduced into talking machines by the exercise of the highest skill and patience on the part of the large staffs of investigators and engineers maintained by the great manufacturing companies. Each part has been developed with skill and pains, and improvement has followed improvement almost imperceptibly, yet markedly improving the quality of sound. Early was speed regulation tested, and the fitting of a proper clockwork motor was not the least of the early important achievements. Naturally sound box, needles, and levers have been developed and perfected, the horn formerly used in reproduction to strengthen the emitted sound was developed, later to be discarded on account of the impairment of quality of the sound owing both to the shape of the horn and also to its material. As a result more attention was given to the wooden resonance box of the accompanying cabinet. The swinging arm and its connecting tube also presented interesting features for improvement, while obviously the size, nature, and mounting of diaphragms



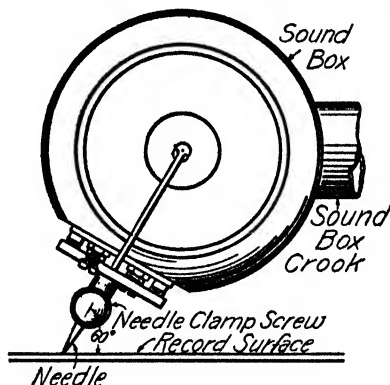
SOUND BOX AND DIAMOND-POINT OF EDISON DISK MACHINE.

have always been a fertile field, and the reproducing needles, either of steel, sharp-pointed fibre for softer tones, or diamond-pointed, as in the case of a late phonograph of disk type, all mark improvements.

In the use of the phonograph, aside from the applications already mentioned, must be con-

sidered its important function in bringing the best work of great musical artists within the reach of all, and its educational influence in spreading a knowledge and appreciation of the world's great operas and other music. Hardly a place is now so isolated that its inhabitants cannot be edified or amused by music, classic, popular, or of sacred character, while the universal spread and more general interest in dancing that took place about 1913 were aided materially by the phonograph, as only in this way was suitable music available for practice and for small gatherings beyond the reach of orchestra or pianist. Conversely, this aroused interest in dancing had its effect on the use and sale of phonographs, materially increasing the growing demand for these machines.

Mention should be made also of a rather serious use of the phonograph, viz., as a permanent record of the voices of distinguished men and women. In 1903 Austria established a bureau for preserving phonographic records, in 1906 such a department was inaugurated at the British Museum, and in 1907 at the Paris Opera House records of great singers were made as a beginning of a collection to be preserved for the benefit of posterity. In the United States, at various centres, important records have been deposited, and the great manufacturing companies have in their vaults original masters'



SOUND BOX AND NEEDLE OF VICTOR MACHINE.

records of artistic and historic importance as well as of priceless sentimental and intrinsic value.

The substitution of disks for cylinders brought about most unexpected and unforeseen results, artistic and commercial. The entrance of new competitors into the field proved a powerful stimulus for constant improvement, so that it would seem that, as far as the reproduction of a solo instrument or solo voices is concerned, the point of perfection has been reached. But the reproduction of mass effects, whether from a chorus or an orchestra (especially the latter), is still far from satisfactory as far as distinction of the various timbres or "clang" effects is concerned. An approximate idea of the vastness of the phonograph industry may be formed from a knowledge of the royalties paid to individual artists. In the case of some of the greatest singers these sums vary from \$10,000 to \$100,000 a year. From a purely artistic standpoint the invention of the phonograph never can be overestimated. It has brought immortality to the reproducing artist also, whose art is thus preserved for future generations. The phenomenal

growth of the appreciation of serious music in the United States (see ORCHESTRA) is owing largely to two factors, the phonograph records and the perfection of the player piano. (See PIANOFORTE.) Quite recently phonograph records have been made of entire operas. Works of such length naturally require several disks—*Aida*, e.g., requires 17.

The extent in the increase in the use and manufacture of phonographs and graphophones can be appreciated best by referring to the volume on "Manufactures," in the *Thirteenth Census of the United States, 1910*, vol. x (Washington, 1913). Here it is stated that, while in 1889 there were but two establishments engaged in the manufacture of these instruments and their records, in 1899 there were 11, with a capital of \$3,348,282 and an annual output valued at \$2,246,274; in 1909 there were 18 establishments, with a total capital of \$14,363,361 and an output valued at \$11,725,996. Of the 18 establishments in the industry, 8 reported the manufacture of phonographs or graphophones, some of which also made other products of the industry, 3 made records and blanks only, and 7 reported the manufacture of parts, supplies, etc.

The number and value of the various products in 1909 are given herewith:

PRODUCT	Number	Value
Phonographs and graphophones	344,681	\$5,406,684
For disk records	191,990	3,224,720
For cylinder records and office dictation	152,691	2,181,964
Records and blanks	27,183,959	5,007,104
Disk records	8,572,805	2,567,717
Cylinder records and blanks	18,611,154	2,439,387
All other products		1,312,208

Considered on the score of value, these various items may be compared with those listed in previous censuses of manufactures as follows.

PRODUCT	1909	1904	1899
Phonographs and graphophones	\$5,406,684	\$2,966,343	\$1,240,503
Records and blanks	5,007,104	4,678,547	539,370
All other products	1,312,208	2,592,185	466,401
Total	\$11,725,996	\$10,237,075	\$2,246,274

These figures, which are the latest available, are useful as indicating the status and growth of an important industry, but they would be considerably exceeded were later statistics available in which the growth owing to increased interest in dancing, the more general adoption of dictating machines in commercial offices, and other circumstances are taken into consideration. Exports of phonographs and graphophones from the United States in 1914 amounted to \$2,512,680. See GRAMOPHONE, GRAPHOPHONE; SOUND, REPRODUCTION OF; TALKING MACHINE.

Bibliography. The sources of information for the phonograph are not so general and so available as the importance of the instrument seems to warrant. The advertising matter of the large companies may be consulted with profit, and for Edison's work reference may be made to Dyer and Martin, *Thomas A. Edison: His Life and Inventions* (New York, 1910). For the invention and development of the gramophone, consult papers of great interest in the

Journal of the Franklin Institute, vols. cxxv, cxxvi (Philadelphia, 1888, 1913). For the manufacture of phonographs and gramophones by most modern mechanical methods, persons interested should read papers in the *American Machinist*, vols. xxxvi, xxxvii (New York, 1912). An interesting phonetic study, based on vibrations of sound as recorded on a phonograph, was made by Dr. E. W. Scripture, *Researches in Experimental Phonetics*, published by the Carnegie Institution (Washington, 1906).

PHONOGRAPHY. See SHORTHAND.

PHONOLITE (from Gk. φωνή, *phōnē*, sound, voice + λίθος, *lithos*, stone). An igneous rock of porphyritic texture which has a chemical composition essentially equivalent to nephelite syenite (q.v.) and generally contains porphyritic crystals of feldspar (sanidine) and nephelite. Most phonolites have been poured out at the surface of the earth as lavas; as, e.g., in the Auvergne of central France and in the Cape Verde Islands. Many phonolites possess a platy parting or separation by cracks into a series of parallel plates, so that they give out a peculiar clinking sound when struck with a hammer. On this account they were formerly known as clink-stones. More subject to alteration from atmospheric agencies than most other rocks, they soon lose their fresh appearance, and frequently show the development of crystals of the zeolite minerals.

PHORADENDRON. An American plant. See MISTLETOE.

PHORBAS (Lat., from Gk. Φόρβας). 1. A son of Lapithes and Orsinome, who freed Rhodes from snakes and was honored by the inhabitants as a hero. He was called *ophiuchus* (the snake holder) and received a place among the stars. In another legend, Alector, King of Elis, secured his assistance against Pelops, and gave him his daughter, sharing the Kingdom with him. 2. A companion of Æneas. The god of sleep assumed his form in order to deceive Palinurus. Consult Vergil, *Æneid*, v, 838 ff.

PHORCUS, PHORCYS, or PHORCYN. In Greek mythology, an aged divinity of the sea. Hesiod and others make him the son of Pontus and Gea and brother of Nereus and Ceto. By the latter he became the father of the Graces and the Gorgons, who are hence called Phorcidæ or Phorcydæ. He was also the father of the nymph Thogsa, who became the mother of Polyphemus, the Hesperides, and the Sirens.

PHORMIO, fôr'mi-ô. A lively and interesting comedy by Terence, produced in 161 B.C. It takes its name from the parasite in the play, which was modeled on the Έπιδουκάδμενος of Apollodorus. From this comedy Molière drew the plot of his *Fourberies de Scapin*.

PHOROMETER. See OPTOMETRY.

PHORONIS (Neo-Lat., from Gk. Φορωνίς, relating to Phoroneus, from Φορωναίς, *Phorōneus*, Phoroneus, an ancient Greek king of Argos). A marine, wormlike animal which has recently been placed in a class by itself (Phoronidea). It lives socially, each worm inclosed in a membranaceous or leathery tube. The body is long, slender, not segmented, and around the mouth is a crown of long, delicate, ciliated tentacles, borne on a horseshoe-shaped lophophore. It is hermaphroditic, developing from eggs, and never asexually from buds. The larva is very remarkable; it is a modified trochosphere and is called an actinotrocha. It may be recognized by the large hoodlike lobe overhanging the mouth, while

there is a postoral circle of large ciliated finger-like tentacles; it rapidly metamorphoses into the polyzoon-like adult. It occurs on the coasts of northern New England and in Europe, while another species inhabits the Australian seas. Consult S. F. Harmer, in *Cambridge Natural History*, vol. ii (London, 1899).

PHORORHACHOS, fô'rô-râ'kôs (Neo-Lat., from Gk. *φωρά*, *phora*, motion, from *φέρειν*, *pherein*, to bear + *ῥαχός*, *rhachos*, brier). A gigantic extinct running bird of prey, skeletons of which are found in the Miocene deposits of Patagonia. It was about 8 feet in height and its skull was larger than that of a horse and was armed with a strong hooked beak like that of an eagle. The wings were small and useless, and the legs long and strong and provided with powerful talons. It appears to have been a swiftly running bird, like the ostrich, though actually related to the herons. Consult F. A. Lucas, "Animals of the Past," in *American Museum of Natural History, Handbook Series*, No. 4 (New York, 1913).

PHOSGENE GAS (from Gk. *φῶς*, *phôs*, light + *-γενής*, *-genês*, producing, from *γίγνεται*, *gignethai*, to become), CARBONYL CHLORIDE, or OXYCHLORIDE OF CARBON, COCl_2 . A colorless suffocating gas, formed by exposing equal volumes of carbonic oxide and chlorine to the action of sunlight. If brought into contact with water, phosgene gas rapidly decomposes into carbonic and hydrochloric acids. It may be readily condensed to a liquid, boiling at 8°C . (46.4°F). It is used in chemical laboratories, as it readily reacts with various substances, so that many organic syntheses can be carried out with the aid of it. It is employed also in the manufacture of certain coal-tar dyestuffs. Phosgene was first prepared by J. Davy in 1811, the name he used indicating that the substance was formed under the influence of light.

PHOSPHATE. The term "phosphate" is applied chiefly to amorphous deposits of phosphate of lime. This substance may occur in the form of (1) beds interstratified with other sedimentary rocks; (2) nodules or grains in limestones and shales; (3) bone beds mixed with a certain amount of phosphatic material; (4) replacement deposits; (5) cavity deposits; (6) gravel deposits; and (7) residual deposits. Not all of these types are necessarily of sufficient richness to be workable. The chief minerals in phosphate appear to be amorphous collophanite (a solid solution of calcium carbonate in calcium phosphate) and crystalline dahllite ($3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaCO}_3$). Phosphates of iron or aluminium may be present in small amounts, while other substances include calcite, quartz, clay, etc. Iron and alumina are the most objectionable impurities, and phosphate is sold under a guaranty not to exceed 2 to 4 per cent of these.

Phosphate deposits are formed through the agency of surface waters. The material may be precipitated from sea water, the purity of the deposit varying with the quantity of other materials laid down on the ocean floor at the same time. In other cases the lime phosphate may be leached out of phosphatic limestones, guano deposits, or bone beds, by downward-percolating ground waters, and later redeposited in cavities, or by the replacement of limestones.

A third process involves the leaching of lime carbonate from phosphatic limestones, leaving the phosphate behind. Phosphate deposits are

of world-wide distribution, occurring in formations ranging from the Silurian to Recent. In Florida they form a crescent-shaped belt paralleling the west coast, and occur as irregular masses replacing Tertiary limestones, or as

PHOSPHATE ANALYSES

	1	2	3	4	5
Bone phosphate.....	84.40	75.77	77.77	73.90	72.66
Ferric oxide.....	0.32	0.80	3.12	...	0.73
Alumina.....	0.82	0.60	2.08	1.00	0.89
Lime carbonate.....	0.20	10.90	...
Silica.....	1.32	4.16	...	3.19	10.00

1, white hard rock phosphate, Florida. 2, land pebble phosphate, Florida. 3, brown phosphate, Tennessee. 4, blue rock phosphate, Tennessee. 5, Wyoming.

gravel deposits. Of great importance are the residual phosphates found in the Silurian of Tennessee and known as brown phosphates. What are perhaps the most extensive phosphate beds of the world occur in the Permian beds of parts of Utah, Idaho, Wyoming, and Montana. Their inaccessibility serves to preserve them as a store for the future. Among the foreign deposits those of Algiers and Tunis yield an abundant supply.

The production in 1914 was as follows:

	Long tons	Value
Florida.....	2,138,891	\$7,354,744
South Carolina.....	106,909	415,039
Tennessee.....	483,203	1,822,770
Western States.....	6,030	15,488
United States.....	2,734,043	\$9,608,041
	Metric tons	
Algeria (1912).....	207,111	\$759,455
Tunis (1911).....	1,592,000	6,824,974
France (1912).....	313,151	1,169,401

Exports of phosphate from the United States in 1914 amounted to \$10,439,000.

Bibliography. Francis Wyatt, *Phosphates of America* (3d ed., New York, 1892); Heinrich Ries, *Economic Geology* (3d ed., ib., 1910); United States Geological Survey, *Bulletin*, Nos. 430, 470, 491, 530, 577, 585 (Washington, 1910-14); Otto Stutzer, *Die wichtigsten Lagerstätten der "Nicht-Erze"* (Berlin, 1911); Florida Geological Survey, *Annual Report*, third, fifth (Tallahassee, 1911-13); A. R. Rose, *Biochemical Studies of Phytosphosphates* (New York, 1912); J. A. Barr, "Mining and Washing Phosphate," in American Institute of Mining Engineers, *Bulletin* (ib., 1914). For the use of phosphate, see MANURE and MANURING.

PHOSPHATE, ODORLESS. See THOMAS SLAG. **PHOSPHATES** (from *phosphorus*), IN PHYSIOLOGY. The following phosphates play an active part in the chemistry of the animal body.

Sodium phosphate occurs in three forms, Na_3PO_4 , Na_2HPO_4 , and NaH_2PO_4 , called respectively the basic, neutral, and acid salts. These are all soluble in water. By exposing the second of these salts to a red heat pyrophosphate of sodium, $\text{Na}_2\text{P}_2\text{O}_7$, is formed, and by similarly treating the third metaphosphate, NaPO_3 , results. Phosphate of sodium in one or the other of the above forms is a constituent of all the fluids and soft tissues of the body, and is especially abundant in the urine and bile. The pyrophosphate and metaphosphate are found in the ashes of animal tissues after incineration,

but they result merely from the action of heat on the neutral and acid salts. The salts of sodium are always associated with the corresponding salts of potassium, and what is said of the derivation, elimination, and physiological importance of the one is equally applicable to the other, except that the potassium salts are more depressant in their action. The alkaline phosphates obviously are derived from the food, being either ingested as such or converted within the organism from other alkaline salts. Elimination is effected chiefly through the kidneys and intestinal canal. In the carnivorous animals, whose blood is much richer in phosphates than that of herbivora, these salts are carried off by the urine; but in consequence of the formation of free acids as products of the disintegration of the tissues, a portion of the base is abstracted from the originally alkaline phosphates and a corresponding portion of phosphoric acid is liberated. The originally alkaline salt is thus rendered neutral or even acid. In the herbivorous animals, on the other hand, the urine contains little phosphate, most of the phosphoric acid of their food being eliminated by the intestinal canal in the form of the insoluble phosphates of lime and magnesia. Although the general distribution of the phosphates of the alkalies in the nutrient fluids (there is 40 per cent of them in the ash of the blood cells, 28.4 per cent of phosphoric acid and 23.5 of potash in the ash of cow's milk, and about 70 per cent of phosphoric acid in the ash of the yolk of egg) is in itself an indication of their importance, the exact nature of their functions is not completely understood. Liebig and others have drawn attention to the peculiar grouping of the acid and alkaline fluids of the animal body. The permanence of this grouping is maintained, especially in herbivorous animals, chiefly by the conversion within the body of alkaline and neutral phosphates into acid phosphates by the means already described. Moreover, the proteins are so closely connected with phosphates that they remain associated during the solution and subsequent reprecipitation of these substances, and the ash of developed tissues (such as muscle, lung, liver, etc.) always affords evidence that acid phosphates existed in the recent tissue; further, no exudation from the blood vessels can undergo transformation into cells and fibres, or, in other words, become organized, unless phosphates are present. Another proof of the share taken by the phosphates in the formation and functions of tissue is the fact that, although herbivorous animals take up a very small quantity of phosphates in their food, and although their blood is very poor in these salts, their tissues contain as large a proportion of phosphates as the corresponding parts of carnivora. The fact that one equivalent of the alkaline phosphate of soda, Na_2HPO_4 , possesses the property of absorbing as much carbonic acid as two equivalents of carbonate of soda leads to the belief that the power of attracting carbonic acid, which the serum of the blood possesses, is due as much to the phosphate as to the carbonate of soda, and that, consequently, phosphate of soda plays an important part in the respiratory process. The phosphates, further, play an important part in the forming of hydrochloric acid in the stomach, setting this acid free from common salt (sodium chloride).

Phosphate of lime occurs in the organism in three forms, viz., as normal calcium phosphate,

$\text{Ca}_3(\text{PO}_4)_2$, monocalcium phosphate, $\text{Ca}(\text{H}_2\text{PO}_4)_2$, and dicalcium phosphate, $\text{Ca}_2(\text{HPO}_4)_2$. The normal phosphate occurs in all the solids and fluids of the body, but is most abundant in the bones, in which it amounts to about 57 per cent, and in the enamel of the teeth, of which it forms from 80 to 90 per cent. It may at first sight appear inexplicable how a salt so perfectly insoluble in water as normal phosphate of lime can be held in solution in the animal fluids. In some fluids, as the blood, it is probably, in part at least, combined with albumen, with which it forms a soluble compound; while in other fluids, as the urine, it is held in solution by a free acid or by certain salts (as, e.g., chloride of sodium). When too small a quantity of this salt is taken with the food the bones lose more or less of their hardness and firmness and fractures do not readily unite. Phosphate of lime, like the phosphates of the alkalies, is indispensable to cell formation; and in the mantle of the mollusks (where new cells for the formation of shell abound) this salt is far more abundant than in any other part of the body. Although by far the greater quantity of the phosphate of lime found in the body has doubtless preëxisted in the food, yet it is unquestionable that a part of it is formed within the organism by the action of carbonate of lime on the phosphoric acid that is formed during the disintegration of the phosphorus-containing tissues. In man and carnivorous animals a certain portion of the phosphate of lime is eliminated by the kidneys and the rest is carried off in the excrements, while in herbivorous animals the whole is carried off in the excrements. The acid phosphate of lime is occasionally found in the urine of man and carnivorous animals, but is of no practical importance. In milk phosphate of calcium is united with casein. The curdling of milk by rennet, as well as coagulation of the blood, is greatly aided by the presence of calcium phosphate.

Normal phosphate of magnesia, $\text{Mg}_3(\text{PO}_4)_2$, is analogous, both in its chemical and physiological relations, to the corresponding salt of lime, with which it is always associated. The abundance of this salt in cereals and vegetables explains its presence in the system. A far less amount of this salt than of the corresponding lime salt seems to be required by the organism, as is shown by the relative quantities in which they occur in bone (57 of the former to 1.3 of the latter), and as is further indicated by the fact that, relatively, far more of this than of the lime salt escapes intestinal absorption and appears in the excrements.

The only phosphates remaining to be noticed are the *phosphate of ammonia* and *magnesia*, or triple phosphate, $\text{MgNH}_4\text{PO}_4 + 6\text{H}_2\text{O}$, which occurs in beautiful prismatic crystals in alkaline urine and urine that is beginning to decompose, and the *phosphate of soda and ammonia*, which is occasionally found as a crystalline sediment in fermented urine.

PHOSPHATIC DIATHESIS, or **PHOSPHATURIA** (Neo-Lat., from *phosphate* + Gk. *ούρον*, *ouron*, urine). The excretion in excessive amounts of the earthy salts of phosphoric acid in the urine. Phosphoric acid is excreted in combination with the alkaline bases, sodium and potassium, and the earthy bases, calcium and magnesium. The alkaline phosphates form about two-thirds of the whole and are always held in solution; the earthy phosphates form

about one-third and are spontaneously precipitated under certain circumstances as phosphatic deposits and calculi. One of the causes of such deposition is an alkaline condition of the urine. The urine in health may be temporarily alkaline from eating much fruit or vegetables containing citrates, tartrates, or malates of potassium and sodium. These are converted into carbonates in the intestines and absorbed as such into the blood, and diminish the acidity of the urine or render it alkaline. The urine is sometimes turbid from a white deposit of the amorphous calcium phosphate ($\text{Ca}_3\text{P}_2\text{O}_8$). This may be mixed with a crystalline phosphate ($\text{CaHPO}_4 + 2\text{H}_2\text{O}$), the so-called stellar phosphate, or a phosphate of magnesia ($\text{Mg}_3\text{P}_2\text{O}_8$). A more common condition, however, is that observed when a feebly acid or neutral urine is heated and a thick white deposit or turbidity occurs. In urine which has undergone ammoniacal fermentation there occurs a precipitate of the ammonio-magnesium or triple phosphate ($\text{MgNH}_4\text{PO}_4 + 6\text{H}_2\text{O}$) in the form of minute triangular prisms.

It has been thought that there is a relation between the activity of the nervous system and the excretion of phosphoric acid. An increased amount is seen in the urine after excessive mental work or worry. This phenomenon is observed also in many diseases characterized by wasting and debility, such as phthisis, leucocythæmia, acute yellow atrophy of the liver, and severe anæmias. The old term "phosphatic diathesis," signifying a constitutional tendency or habit of body that produced or promoted a deposition of the phosphates from the urine, is no longer recognized.

PHOSPHATIC FERTILIZERS. See MANURES AND MANURING.

PHOSPHATIC SLAG. See THOMAS SLAG.

PHOSPHINE, fōs'fīn or -fēn. See PHOSPHORUS.

PHOSPHOR BRONZE. An alloy (q.v.) consisting of copper, zinc, and tin in various proportions, with a small quantity of phosphorus which has been introduced in the form of phosphor tin. The addition of phosphorus was first suggested by Montefiore and Kunzell of Liège, Belgium, in 1868. The addition of phosphorus has the effect of eliminating the oxides and, by causing the tin to assume a crystalline structure, increases the homogeneity of the alloy and thereby its elasticity and absolute resistance. In consequence phosphor bronze has met with considerable demand where special strength or power of resisting wear is required, as in the case of bearings for quick-running machinery and screw propellers. See ALLOY.

PHOSPHORESCENCE. It has been observed that many bodies continue to emit light in a darkened room after having been exposed to sunlight or some other strong source of light. This phenomenon is called phosphorescence. Although the name is evidently derived from "phosphorus," it should be noted that the cause of the luminosity of phosphorus is a slow oxidation and is not due to its having been previously exposed to light. Phosphorescence itself is a special case of fluorescence (q.v.), and cases where there are permanent chemical changes are excluded. Those substances which phosphoresce most brilliantly are the sulphides of barium, calcium, and other alkaline earths, diamonds, sugar, etc. It has been found that the phos-

phorescent light is often brilliantly colored and also that the color of the light to which the body is exposed in order to excite phosphorescence has a very important influence upon the intensity of the phosphorescent light itself. It is observed that the same law connecting the exciting light and the phosphorescent light holds true as was noted in the case of fluorescence, viz., that the phosphorescent light is of a longer wave length than the exciting light. Nearly all bodies showing fluorescence show phosphorescence when in the solid state, as e.g., if when liquid they are dissolved in gelatin and then dried. One of the earliest and most important investigations of phosphorescence was made by E. Becquerel, who made a special study of the interval of time phosphorescence would continue after the phosphorescing body was removed from the light. He invented an instrument known as the phosphoroscope, which enabled him to measure with the greatest exactness the small intervals of time involved in the phenomena. He observed that many bodies in which by ordinary means of observation there was no trace of phosphorescence can be shown to phosphoresce for minute fractions of a second. For instance, after exposure to sunlight, calcite shines with orange-colored light; aragonite gives a greenish light, as does lead glass also; uranium glass shines with a greenish light which lasts for about one-thirtieth of a second, although it has its maximum intensity at about one three-hundredth of a second after the sunlight has been withdrawn. Sapphires and rubies give a brilliant pure red light, as do almost all the minerals which contain aluminium.

One most interesting feature of phosphorescence is that if a body is phosphorescing, as e.g., a piece of paper covered with Balmain's paint, the application of heat at any one point will destroy the phosphorescence there. This evidently furnishes a method for the study of those portions of the spectra which lie in the infra-red region, i.e., those wave lengths which are too long to affect our sense of sight. For if a strip of paper covered with Balmain's paint is exposed to sunlight for a short time and then taken into a darkened room and so placed that the infra-red spectrum coming from any source falls upon the paper, those places where there is radiation will be made manifest by the disappearance of phosphorescence owing to the heating effect of the rays of the spectrum.

Within recent years the phenomena of phosphorescence have been reduced to a scientific basis, largely by the work of Lenard and Klatt. These investigators have proved that in order to have a phosphorescent complex it is necessary to have it made up of three parts: (1) a sulphide of one of the alkaline earths, e.g., barium; (2) a trace of a pure metal, e.g., bismuth; (3) a soluble flux, e.g., salts of sodium. The absence of any of these three constituents prevents phosphorescence; and the nature of the light emitted depends upon the character of each of the three parts, as well as upon the temperature. Some writers call the sulphide the luminophos and the metal the electrogen. The most satisfactory theory of the simpler phenomena of phosphorescence is that of J. D. Kowalski (*Philosophical Magazine*, xiii, London, 1907). See FLUORESCENCE; LIGHT.

PHOSPHORESCENCE OF THE SEA. See LUMINOSITY OF ANIMALS.

PHOSPHORIC ACID, H_3PO_4 . An acid com-

pound of phosphorus, hydrogen, and oxygen, first obtained by Scheele in 1777. It may be prepared by carefully heating yellow phosphorus with dilute nitric acid for several hours and driving off the excess of nitric acid by heat. Pure phosphoric acid is a colorless crystalline substance melting at about 41°C . (105.8°F). It is a tribasic acid, the three hydrogen atoms in its molecule being replaced gradually and the result being three series of salts, like NaH_2PO_4 , Na_2HPO_4 , and Na_3PO_4 . The neutral salts of the alkali metals have a strongly alkaline reaction. When heated above 300°C . (572°F), phosphoric acid is converted into pyrophosphoric acid, $\text{H}_2\text{P}_2\text{O}_7$, which was first prepared by Gay-Lussac in 1829. Several of the salts of phosphoric acid are used in medicine. The most important phosphates are described under the names of the metals. See also PHOSPHORUS.

PHOSPHORITE. The massive, concretionary, and mammillary form of apatite, especially the variety found in Estremadura, Spain. The name was first used by Kirwan in describing the phosphates found in Spain, which occur in veins, and in pockets in the Silurian schists.

PHOSPHOROSCOPE (from Lat. *phosphorus*, Lucifer, phosphorus + Gk. *σκοπεῖν*, *skopein*, to behold). An apparatus invented by Becquerel for measuring the duration of phosphorescence in different bodies. See PHOSPHORESCENCE.

PHOSPHOROUS ACID, H_3PO_3 . A tribasic acid formed by the action of water on trichloride of phosphorus. It is a crystalline substance melting at 70°C . (158°F). Its salts are termed phosphites.

PHOSPHORUS. One of the nonmetallic chemical elements. It was discovered by Brandt, a Hamburg alchemist, in 1669, while experimenting with urine with a view to preparing a liquid for the transformation of silver into gold. Kunkel, on learning of the discovery, published, in 1678, a work entitled *De Phosphoro mirabili*. The existence of phosphorus in bones was discovered by Gahn (about 1769), and subsequently phosphorus became a well-known and cheap substance, variously called Brandt's phosphorus, Kunkel's phosphorus, Kraft's phosphorus, Boyle's phosphorus, and English phosphorus, while the name "phosphorus," unqualified, was applied to phosphorescent substances in general until the antiphlogistic nomenclature introduced the present usage. The elementary nature of phosphorus was first recognized by Lavoisier in 1780. See CHEMISTRY.

Phosphorus does not occur free in nature, but is found abundantly in the form of phosphates. The minerals of the apatite group (combinations of calcium phosphate with calcium chlorifluoride) struvite, vivianite, wavellite, and many other minerals, contain considerable amounts of chemically combined phosphorus, but the principal source of phosphorus is still the substance of bones, which consists chiefly of the neutral phosphate of calcium. Calcium phosphate is the chief constituent of coprolites and guanos also, and calcium and magnesium phosphates are found in the ashes of plants. Ammonium-magnesium phosphate is the chief constituent of urinary sediments, while in combination with carbon, hydrogen, oxygen, and nitrogen, phosphorus is found in the yolk of eggs, in the blood and other animal fluids, and in the substance of the brain and nerves.

Phosphorus is sometimes obtained from mineral phosphates. Usually, however, it is manufactured from bone ash, which consists largely of neutral calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$. The bone ash is treated with sulphuric acid of specific gravity 1.5 or 1.6, the quantity of acid used being exactly sufficient to convert all the calcium present into calcium sulphate. This sets free in solution the phosphoric acid, while the calcium sulphate is precipitated out.

The phosphoric acid is then concentrated and next heated to a dull-red heat, which changes it to metaphosphoric acid, HPO_3 . The latter is finally mixed with sawdust or coke or charcoal and strongly heated in clay retorts, the result being liberation of the phosphorus, while hydrogen and carbon monoxide gases are given off as by-products. The phosphorus vapors are condensed under water in suitable vessels of clay. The crude product thus obtained may be somewhat purified by melting under water and pressing through porous plates. Arsenic, an impurity usually introduced with the sulphuric acid employed in the manufacture of phosphorus, may be removed by means of nitric acid. When pure the phosphorus is melted and cast in the form of sticks by sucking it into glass tubes and allowing to solidify.

The chemical symbol of phosphorus is P; its atomic weight is 31.04. The properties of free phosphorus are not always the same, the element being capable of existing in several different allotropic forms. (See ALLOTROPY.) The vapor of phosphorus has invariably the same density, leading to the molecular formula P_4 . (See MOLECULES—MOLECULAR WEIGHTS.) Experiment leads to the view that when dissolved in benzine phosphorus has a similar constitution. But the remarkable differences between the liquid and the several solid modifications of the element are by no means understood. Common or yellow phosphorus, which is ordinarily obtained by the manufacturer, is a transparent waxy substance that may be prepared in the form of crystals of the regular system by sublimation or by crystallization from solutions in carbon disulphide, in which the other varieties of phosphorus are insoluble. Its melting point is 44.5°C . (112.1°F .) and its specific gravity at 0°C . (32°F .) is 1.837. It phosphoresces in the dark, and it is quite certain that even in inert gases the phosphorescence is caused by the presence of traces of oxygen, which oxidizes yellow phosphorus very readily. As a matter of fact, when kept in a vacuum or in gases which have been thoroughly freed from oxygen, phosphorus gives off no light. In the air, at ordinary temperatures, yellow phosphorus undergoes slow oxidation (see OZONE), and may readily take fire even if carelessly rubbed. It may be caused to burn under water by gently warming the latter and passing a current of oxygen into it. Besides, yellow phosphorus is extremely poisonous. It must therefore be handled with great care. The use of phosphorus for matches is well known. (See MATCHES.) Red phosphorus was discovered by Schrötter, of Vienna, in 1845. It is formed by the action of light on common phosphorus. Red phosphorus may be best made by heating yellow phosphorus in a relatively small closed vessel to about 400°C . (750°F .) and allowing the temperature to fall very slowly between 400° and 250°C . (750° and 480°F .). Red phosphorus may be transformed into yellow by heat-

ing to about 400° C. (750° F.) and cooling the vapor rapidly. Red phosphorus melts at about 630° C. (1134° F.); its specific gravity is 2.14. It does not phosphoresce in the dark, is not poisonous, and is in every way harmless. (See MATCHES.) Crystalline (metallic) phosphorus is formed during the solidification of molten amorphous phosphorus. It may be obtained in the form of long red tabular crystals having a distinct metallic lustre. Its specific gravity is 2.34. Black phosphorus is formed when melted yellow phosphorus is rapidly cooled. Two other allotropic varieties of phosphorus have been described.

Compounds of Phosphorus. Phosphorus forms at least three different compounds with hydrogen, viz., a solid hydrogen phosphide, P_2H_4 ; a liquid phosphide, P_2H_2 ; and a gaseous phosphide, PH_3 , called phosphine. The last-named compound, analogous to ammonia (NH_3), is usually prepared by heating phosphorus with a strong solution of caustic potash. When thus prepared, however, it contains some vapor of the liquid phosphide, P_2H_2 , and as the latter takes fire spontaneously in the air, the impure phosphine, too, is inflammable. But under the influence of light, or by the action of strong hydrochloric or sulphuric acid and certain other substances, the vapor of the liquid phosphide is decomposed; and if pure phosphine is prepared, say, by passing the impure gas through concentrated hydrochloric acid, it is found not to take fire in the air. The odor of phosphine resembles that of garlic and of rotten fish. The oxides of phosphorus include phosphorus trioxide, P_2O_3 , and phosphorus pentoxide, P_2O_5 . The latter, usually termed phosphoric anhydride, is formed when common phosphorus burns in the air. It forms a white, exceedingly hygroscopic powder, taking up water with great energy to form phosphoric acid. With the halogens phosphorus forms a trichloride, PCl_3 ; a pentachloride, PCl_5 ; a tribromide, PBr_3 ; a pentabromide, PBr_5 ; and a triiodide, PI_3 . All these compounds are formed by the direct union of the elements. A trifluoride, PF_3 , and a pentafluoride, PF_5 , are also known.

Phosphorus is a constituent of many tissues, especially the nerve centres, and its physiological action is that of a tonic. In medicine it is used chiefly in nerve exhaustion, myelitis neuralgia, osteomalacia, and rickets. It has been used with success in lupus, acne, and psoriasis. It may be given in a pill or in solution, the latter being the preferable. It may be exhibited dissolved in oil or in chloroform. Phosphide of zinc has been used as a substitute for phosphorus.

Consult F. Dawidowsky, *Glue, Gelatin, Animal Charcoal, Phosphorus, Cements, Pastes, and Mucilages* (2d ed., Philadelphia, 1905). See ANTIDOTE.

PHOSPHORUS (Lat., from Gk. *φωσφόρος*, light bringer). A name of the planet Venus as the morning star, also called Lucifer (q.v.). As an evening star it is called Hesperus and Vesper.

PHOSPHORUS, SALT OF. See MICROCOSMIC SALT.

PHOTEOLIC. See NYCTOTROPIC.

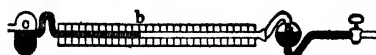
PHOTIUS, fō'shī-ūs (Lat., from Gk. *Φῶτιος*) (c.820–c.891). Patriarch of Constantinople, one of the greatest theologians and scholars of the Greek church. He was a member of a patrician family of Constantinople and during the first

period of his life filled various important public offices. In 857 Bardas, minister of the young Emperor, Michael III, undertook to remove the Patriarch Ignatius (see IGNATIUS, SAINT) from his position, and Photius, after being hurried through all the clerical offices in six days, was put in his place. Pope Nicholas I (q.v.) espoused the cause of Ignatius and excommunicated Photius in 863. The latter maintained his position, supported by the court, and in 867 assembled a council at Constantinople which excommunicated the Pope and his partisans and withdrew from communion with the see of Rome. (See GREEK CHURCH.) The same year Basil I succeeded Michael as Emperor, Photius was desposed and Ignatius reinstated. Ten years later, after the death of Ignatius, Photius was restored, and the Pope, John VIII, was induced to acquiesce. Photius assembled a council in 879, which decided all questions at issue between the East and Rome as he dictated, and in consequence the Pope excommunicated him in 881. In 886 the Emperor Leo banished Photius to an Armenian cloister, and he died there about five years later. Photius is revered by the Greek church, while the Western church accuses him of craft, violence, and perjury. His theological works include the *Amphilochia*, which not only discusses doctrinal and exegetical questions, but treats also of philosophy, science, medicine, grammar, and history; commentaries on the Gospels and Epistles; and a treatise in favor of the Greek doctrine of the procession of the Holy Spirit. The *Nomocanon* ascribed to Photius is of doubtful authorship. His chief literary and scholarly work is the *Myriobiblon* or *Bibliotheca*, a summary review of 280 works which he had read, most of which are now lost. He also wrote a *Lexicon*, for use in reading the classic authors and the Scriptures. A number of Photius' letters are preserved, as well as sermons of much merit. His works are in Migne, *Patrologia Græca* ci-cv. Consult: Joseph Hergenröther, *Photius, Patriarch von Constantinopel* (3 vols., Regensburg, 1867–69); id., *Monumenta Græca ad Photium Spectantia* (ib., 1869); W. F. Adeney, *The Greek and Eastern Churches* (New York, 1908); J. Ruinaut, *Le schisme de Photius* (Paris, 1910).

PHOTOCHEMISTRY. The branch of general chemistry that deals with chemical changes immediately producing or caused by light. In interpreting this definition it must be borne in mind that the combustion of illuminants cannot properly be classed as a form of photochemical changes, for the reason that combustion transforms the chemical energy of the illuminant, primarily not into light, but into heat, the latter then giving rise to the production of light. The chemical changes immediately producing light include those undoubtedly taking place at ordinary temperatures in the fireflies and other luminescent organisms, as well as in the eye. All such changes are as yet very imperfectly understood, and photochemical research has been confined almost exclusively to the opposite phenomenon, i.e., to chemical changes caused by light.

Actinometry. That light is capable of causing chemical transformations was not unknown in the eighteenth century. That silver chloride turns dark under the action of light was known to Schultze as far back as 1727. In the latter part of the century it was recognized that sunlight enables plants to decompose carbonic acid

gas and set free its oxygen, and about 1840 Liebig grasped the full importance of this process in the economy of nature. But all photochemical knowledge remained qualitative until John W. Draper, of New York University, about 1842, introduced the quantitative measurement of the chemical action of light by constructing the first actinometer. Gay-Lussac and Thénard had observed in 1809 that a mixture of equal volumes of chlorine and hydrogen, which may be preserved indefinitely in the dark, reacts with explosive rapidity if exposed to intense light, and slowly if the light is weak. The product of the reaction is hydrochloric acid gas, which is freely soluble in water, while hydrogen and chlorine are soluble only sparingly. To measure the effect of light in causing the reaction, Draper introduced a mixture of precisely equal volumes of hydrogen and chlorine into a glass



DRAPER'S ACTINOMETER.

bulb, *a*, half filled with water and joined to a glass tube, *b*, likewise filled with the gaseous mixture, provided with a scale, and in its turn joined to a wide vessel, *c*, filled with water. He then exposed the upper part of *a* to light, whereupon part of the hydrogen and chlorine combined into hydrochloric acid, the latter was absorbed by the water, and the consequent diminution of the gaseous volume was shown by the length of the column of water entering from *c* into *b*. Draper's actinometer was improved in 1862 by Bunsen and Roscoe. But even the improved form of the apparatus did not permit sufficiently rapid experimentation, and consequently the method was soon abandoned. Instead, Bunsen and Roscoe employed an actinometer which measured the chemical intensity of light by the time required to darken a photographic film to a certain standard degree.

In 1879 Eder devised a new method of actinometric measurement. If a mixture of mercuric chloride (corrosive sublimate) and ammonium oxalate in aqueous solution is exposed to the action of light (especially the ultra-violet rays), a chemical change takes place resulting in the precipitation of mercurous chloride (calomel), the quantity of which measures the chemical intensity of the light. Account must of course be taken of the fact that the amount of calomel precipitated not only depends on the intensity of the light, but is also influenced by the varying concentration of the solution during the experiment.

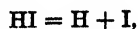
In 1897 Rigollot constructed an actinometer by immersing into a solution of common salt two copper plates whose surfaces were previously oxidized in the flame of a Bunsen burner, and exposing one of the plates to the light. If the two copper plates of this apparatus are connected by a wire, an electric current is found to flow from the dark plate towards the illuminated one, the intensity of the current being proportional to the intensity of the light and hence being capable of serving as a measure of the latter. It may be observed that the principle of electrochemical actinometry was discovered as far back as 1839, by Becquerel, who found that a current passed between two silver plates covered with films of chloride of silver

and immersed in dilute sulphuric acid if one of the plates was exposed to the light.

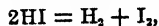
General Principles. Passing now to the few known general principles of photochemistry, it must be observed first of all that while it was formerly believed that light of certain colors only (actinic rays) was capable of chemical action, it is now generally admitted that chemical changes can be produced by light of any wave length whatever, including the infra-red and the ultra-violet rays. It is further generally admitted that if a substance is at all incapable of absorbing light, it is also incapable of undergoing photochemical changes of any kind. It is often possible, however, to increase the capacity of a substance for absorbing light by mixing it with other substances that absorb light freely.

When light produces a chemical change it naturally loses more or less of its original intensity, part of its energy being transformed into chemical energy. When, therefore, light passes through a medium in which it causes some chemical change, its intensity is diminished, first through purely optical absorption and secondly through photochemical extinction. Thus, e.g., if light is passed through a given volume of chlorine gas, it is partly converted into heat and its intensity is found to have diminished by a corresponding amount. If now, in a second experiment, light of the same original intensity is passed through a mixture of chlorine and hydrogen, the intensity is found to have diminished by a greater amount than in the first experiment, owing to the photochemical combination of chlorine and hydrogen into hydrochloric acid. The absorption of light by the hydrogen gas present in the second experiment is small and may be left entirely out of account. In either experiment the diminution of intensity may of course be measured by means of one of the actinometers described above.

In conclusion it may be pointed out that if a given substance is capable of undergoing a chemical change both under the influence of light and without this agency, the change in the two cases need not necessarily be quite the same. Thus, it has been proved that the decomposition of hydriodic acid takes place, under the influence of light, according to the equation



i.e., molecule after molecule of hydriodic acid is primarily decomposed into single atoms of hydrogen and iodine. On the other hand, if hydriodic acid is decomposed by heat, without the intervention of light, the decomposition takes place according to the equation



i.e., the molecules are decomposed in pairs, each pair yielding a molecule of hydrogen gas and a molecule of iodine. In recent years excellent work on the action of light upon organic compounds has been done by Ciamician.

Bibliography. J. W. Draper, *Scientific Memoirs: Being Experimental Contributions to a Knowledge of Radiant Energy* (New York, 1878); J. M. Eder, *Handbuch der Photographie* (Halle, 1882-88); Raphael Meldola, *Chemistry of Photography* (London, 1889); Bunsen and Roscoe, *Photochemische Untersuchungen* (Leipzig, 1892); Lewis Derr, *Photography for Students of Physics and Chemistry* (New York, 1906); Sheppard and Mees, *Investigations on*

the Theory of the Photographic Process (ib., 1907); Johannes Plotnikov, *Photochemie* (Halle, 1910); Fritz Weigert, *Die chemischen Wirkungen des Lichts* (Stuttgart, 1911); Johannes Plotnikov, *Photochemische Versuchstechnik* (Leipzig, 1912); W. Nernst, *Theoretische Chemie* (Stuttgart, 1913). See ACTINOGRAPH; PHOSPHORESCENCE; PHOTOGRAPHY; PHOTOSYNTHESIS.

PHOTO-ENGRAVING. The art of preparing, by means of the chemical action of light upon certain bodies, an engraved plate or block for printing. There are two forms of this, as there are of manual engraving, viz., engraving in intaglio, in which the ink for printing enters the incised lines and remains there while the rest of the plate is cleaned off; and relief engraving, in which the ink is deposited upon the projecting parts of an engraved block or plate. In either case the paper takes the ink from the surface as in the printing of ordinary manual engravings. Photolithography, the preparation by chemical effects of light of plane surfaces for printing, is treated under LITHOGRAPHY.

Intaglio Photo-Engraving. This is known by the general name *photogravure*, a French term generally accepted in all languages. *Heliogravure* is a term which may be taken as the equivalent of *photogravure*, varying in meaning as does that more general term; but at different times the name *heliogravure* has been given to special patented or secret processes. *Photogravure* may have the appearance of pure line work, exactly as in manual line engraving (q.v.), and it may have the appearance of tint or shade without line, nearly as in the case of mezzotint (q.v.). This form of the art has been carried to so great a perfection by some workmen, especially in France, that it is to be compared only to the finest and most artistic hand work, having in addition to that artistic charm an accuracy of reproduction to which the manual work cannot pretend. In the case of line *photogravure* the facsimile of a drawing or of a print from an engraved plate may be so perfect as to be indistinguishable from the original except by the most minute examination of an expert. Thus, in the published work of Amand-Durand of Paris the facsimiles of fine prints from the plates of Dürer, Rembrandt, Claude, Paul Potter, and other celebrated etchers and line engravers caused astonishment and doubt among collectors of prints when those facsimiles first appeared about 1870. In all these processes, however, hand work has to be called in to complete the plate; and it is a general truth that the most artistic workmen produce the most perfect *photogravures*. In the case of Amand-Durand there was the peculiar advantage that the director himself was a skilled engraver before he undertook the photo-engraved process.

Gelatin treated with bichromate of potash is made insoluble under the action of light. Instead of gelatin some form of albumen may be used, or asphaltum, which is found to answer equally well and to be cheaper. This general property underlies all photomechanical-process work. In making a *photogravure* in line a photographic transparency, or positive, of the drawing, or print, or picture, or object which is to be reproduced is placed in contact with a copper plate coated with asphaltum or albumen mixed with a bichromate, and strong light is allowed to pass through the negative to the sensitized surface. Only those parts where the

light passes through the negative without interruption will be marked by complete insolubility of the gelatin; elsewhere the surface remains soft and capable of being dissolved away by washing. In this way the surface of the prepared plate affected by light is turned into a relief copy of the original. The plate is then etched by an acid, perchloride of iron, which eats it away exactly as in the case of ordinary etching. (See ETCHING.) When it is a line plate which is being prepared no other important steps are necessary; but when the plate is to be a tint plate or gradation plate without line and producing prints much like those taken from a mezzotint, it is usual to prepare the surface of the copper plate in the first place by precipitating upon it a fine powder of resin or of resin and asphaltum in combination. This powdered surface prevents the complete access of the mordant to the metal exactly as in the case of aquatint (q.v.). The granular surface so obtained may be either coarse or indefinitely minute, this depending upon the character of the subject to be reproduced. In this way the reproductions of portraits by the greatest master of refined execution or landscapes of minute detail of most varied character may be reproduced with a perfectness of gradation equal to that of hand work in its highest perfection.

As it is customary to illustrate costly books by means of large *photogravure* plates, so it is usual to employ artists of celebrity to make original monochrome pictures for such reproduction. These are sometimes produced in the more usual fashion by means of water-color work in bistre, sepia, India ink, or other one-colored pigment, but they are also made on a very large scale by oil painting on canvas, exactly as in the case of paintings intended for exhibition or sale, except that they are worked in such gray or brownish-gray pigment as the painter and the photographer agree upon as convenient for the one and most easily adapted to the work of the other. It may be stated, also, that the improvements made in orthochromatic photography have made it possible to obtain very accurately the relative color values of the most difficult subjects, such as elaborate oil paintings.

An original difficulty with the employment of *photogravure* in book work was the great cost, not alone in the production of the plates (for it was, and in the case of the finer work still is, not uncommon to take two or three months in the perfecting of a large plate), but of the printing, which had to be done on a hand press, and slowly, so that every separate impression, of which 50 may be bound up in a folio volume, would cost a definite sum of money over and above the cost of the plates. It is on this account that modified processes are being continually brought forward and used to produce plates from which the printing may be done more rapidly. There is, however, always the difficulty in printing from intaglio engraving, that in order that the paper shall take the ink from the incised lines perfectly, leaving none behind, so that the design is reproduced in every minute particular by the raised pattern of ink on the paper, only a slow and painstaking process will serve.

Methods of *photogravure* have been introduced in which a screen is employed to make the grain exactly as in the case of the half-tone

process described below. This, of course, tends towards much greater ease in rapid printing. Furthermore by a special process photogravure plates are available for rotary power printing, when the design is transferred to a copper cylinder and duly etched in.

Relief Photo-Engraving. This covers all those processes by means of which a surface is prepared like that of a wood engraving, the lines, points, and small surfaces which are to be reproduced upon the paper standing up in low relief from the background, which is cut away. The level surfaces of these lines and points must be exactly true and uniform, all in one plane, except where it is deliberately lowered in one place or another in order that the block at that point shall press the paper less firmly and the ink impression show pale in contrast with other and blacker parts.

One of the most difficult of these processes is that called commonly the gelatin process, or, to distinguish it from others also depending upon gelatin, the swelled-gelatin process, worked out in 1871-72 by John Moss in New York and one of the first practical photo-engraving processes. It is an expensive process and one requiring the greatest care to employ it successfully, but its results are not very markedly inferior to that of photogravure that is not in distinct line. In fact, a good print made by this process may be often taken for a photogravure print of somewhat inferior excellence, without clear black and white, with a too uniform texture and a cloudy rendering of details. A sheet of glass is coated with a film of gelatin sensitized with bichromate of potash and exposed under a black and white negative. The film is then soaked in water and swells up where the opaque lines corresponding to the whites of the design protected the film, while the surface of the film corresponding to the black lines of the design do not swell. The surface is hardened by a solution of sulphate of iron and coated with asphaltum in solution, on which hot wax may be poured. The wax with its asphalt surface stripped from the swelled gelatin by immersion in water gives a relief surface. From the surface so produced a matrix is made, and from this another in a material such as wax, and, again, an electrotype of copper is made and mounted upon a block to give it the requisite stiffness and thickness.

The Woodbury type, the collotype, the artotype, the heliotype, the albertype, and many similar processes are all based upon the properties of certain resinous and glutinous substances and their changes when submitted to light. Asphaltum, albumen, and gelatin are the three used. These processes, however, involving printing from a film of gelatin, made selective of either a greasy ink or water so that it can be printed just like a lithograph stone.

Half-Tone Process. As early as 1852 it was proposed by Fox Talbot to resolve an image into a series of dots of greater or less intensity and then prepare a printing plate. His process involved the use of the discovery of Mungo Ponten that bichromate of potash in contact with organic matter decomposed under the influence of light. Various experiments, some more or less successful, followed both in Europe and the United States, and such process work was actually executed, but modern half-tone as now carried on has resulted from the invention of the mechanical art of ruling lines of extreme fine-

ness, of perfect uniformity in width, and at absolutely equal distances from one another. This, which was not practicable until within comparatively recent years, has now been developed so that plates of glass can be ruled in this way with minutely incised lines, 200 or even in extreme cases 400 to an inch. When two glass plates, each ruled with lines of this sort, e.g., diagonally across the plate, are brought together in such a way that the two sets of lines cross one another, the result is, as seen by transmitted light, a fine network of square or diamond-shaped mesh. The transparent parts or apertures, which are uniform in size, have a total area of about one-third of the entire plate. The half-tone process depends upon this screen, as it is called, and this was first put on a satisfactory basis by F. E. Ives, of Philadelphia, who in 1885-86 united two single line screens as above described. In 1893 Max Levy, of Philadelphia, perfected the process of manufacture and patented a method of ruling and etching the lines into glass and filling in the interstices with a black pigment. The two sets of parallel lines were then united diagonally and cemented together with Canada balsam.

The photographic negative is made by light passing through the ruled screen, placed at a suitable distance in front of the sensitive plate, and the result is an image broken up into minute dots, easily seen with a magnifying glass. There is no absolutely continuous gradation of tint, but everywhere a series of very small dots which constantly increase and decrease in darkness or intensity, conditioned upon the relative lights and darks of the subjects to be reproduced, and which are small enough to produce a general effect of uniform gradation. This negative reversed is placed in contact with a carefully prepared copper plate that has been coated with a preparation of fish glue, bichromate of ammonia, albumen, and water. It is then exposed to the light and afterward washed in water, and those parts protected from the light by the dense portions of the negative will be washed out of the half tones in due proportion. After burning in, i.e., heating over a gas stove, the plate is ready for etching, which is done in the case of a copper plate with perchloride of iron or, if zinc is used, with nitric acid.

The half-tone process requires less artistic sense and ability than, e.g., photogravure, but it requires the neatest handling, the most perfect delicacy of treatment, and it is often necessary for a good block that the acid should be applied in several consecutive rebittings before the surface is perfect. In much of the finest work of to-day the highest lights and delicate tone gradations are very skillfully retouched by an experienced engraver. Much of the reengraving by hand, however, is clumsily done and adds to the shortcomings of poor plates. On the other hand, rapid and ordinary commercial work has made possible the wider illustration of books, magazines, and daily papers, and in the latter, where the greatest speed is essential and a plate with screen coarse enough to be printed on ordinary newspaper, notable developments have been achieved even at the expense of artistic results.

The special utility of the half-tone block is in this, that it can be printed with type in any ordinary press or printing process. In order that this may be done the metal plate is backed up by a block of wood or metal of the right

thickness, so that the surfaces of the prepared metal shall be exactly even with the face of the types. With reasonably careful work in the preparation of the electrotype plates and the like, a page may be printed of typography with pictures of full light and shade embodied in it; the whole printed together, and that even on the power press, the only essential consideration being that the paper on which it is printed shall be smooth finished or, for finest work, coated so as to afford a polished surface.

The Line-Cut Process, or Zinc Etching, gives an exact facsimile of a drawing in solid or dotted black lines. Any drawing an artist will make with a point, as of a pen, or a brush, which does not include tints or half-tones, can be reproduced in exact facsimile. The process is similar to those described above, only a negative of greater intensity is required. The film of such a negative is then removed or stripped from the original plate of glass for printing. The light passing through the negative, made in the usual way, hardens the prepared surface of a polished sheet of zinc, and the unsoftened stuff is washed away, after which the film is powdered with a resinous powder which attaches to the ink image where the albumenized surface has been acted on. The metal plate is then etched with acid. In fact, this may be considered the original process from which the half-tone process has been produced by natural evolution, i.e., by the development along obvious lines. The line-cut block can be used in connection with type exactly as half-tones, at a very much less cost and with greater facility and less care in the manipulation.

Color Printing from Photo-Engraved Surfaces. The most important processes of this kind are these known as the three-color and four-color processes. These have become very familiar and widely used. The system is based upon the scientific fact that all the colors of the spectrum may be obtained from the three primaries, red, blue, and green. The rays of light are separated by means of what are called photographic filters, which are partly transparent substances which allow particular rays to pass, while they stop or restrain others. Thus, one of the three filters will allow only blue rays to pass. By this appliance used in connection with the half-tone process there may be produced a perfect blue picture, and again with the use of other filters a green and a red or approximately red picture. The printing of all these, one upon another, approximates very closely the complete chromatic result desired, i.e., a picture in full color. The first practical work in this field was accomplished by a lithographer in Berlin named Ulrich, who received a medal for results shown at London in 1891, but used a fourth printing, either gray or black, to get strength in his shadows. Ives showed a three-color half-tone print in 1885, and William Kurtz of New York in 1893 exhibited successful work printed from three half-tone blocks that really established the process as a commercial and artistic success. The chief difficulties of the process are in the making of correct negatives, accurate registration in printing, and appropriately colored inks. The result so far may be said to approximate the reproduction of fine manual painting. One obvious reason for this imperfection of the result is found in the inferior effect of colors superimposed to those which are

laid side by side. Every student of painting knows how much more brilliant a gradation can be procured by putting touches of color close together, side by side, than by laying those colors over one another. It is true that much work, especially in oil painting, is done by superimposed color, but this is when the upper coat of pigment is more or less translucent, as when the yellow below shows through the thin glaze of blue to produce a certain quality of green. Commonly the juxtaposition of color is more brilliant than the superimposition of color; and this fact causes an indefinitely great amount of thought and experiment among those who are trying to improve the three-color process. In much of the best color work now a fourth plate is made in one of several ways, and this is printed in black or gray in order to secure depth in the shadows and improve the general appearance.

Other and more complex processes of photographic color work have been introduced in the United States, and some of the results are surprisingly accurate reproductions of the originals. Consult: Julius Verfaesser, *The Half-Tone Process* (4th ed., London, 1907); Harry Jenkins, *Amstutz' Handbook of Photo-Engraving* (3d ed., Chicago, 1907); S. H. Horgan, *Half-Tone and Photomechanical Processes* (ib., 1913).

PHOTOEPINASTY (from Gk. *phōs*, *phōs*, light + *ēpi*, *ēpi*, upon + *naōs*, *naōs*, solid, from *naōsein*, *naōsein*, to press close). The action of light in accelerating the growth of the upper sides of dorsiventral organs, such as leaves. See GROWTH.

PHOTOGRAPHIC SURVEYING (from Gk. *phōs*, *phōs*, light + *grāphō*, *grāphō*, to write). In recent times the art of photography has found its way into surveying, an application due chiefly to the French. Its advantage was at once recognized for military and topographical uses, but its value for accurate and extensive surveys is still quite limited, owing to the imperfections of the photographic lens, though it has been employed extensively in the survey of western provinces of the Dominion of Canada. The chief instrument is a view camera provided with cross wires and an apparatus for leveling, though new special cameras to attain increased precision are used. A survey is effected by selecting at least two stations and measuring the base lines between them. Then at each station a series of plates are exposed, the camera being turned at each successive exposure sufficiently to obtain for the series a continuous photograph of the area to be surveyed. The method of executing a map and of calculating heights and distances from photographs is best obtained from works on the subject, but a general idea may be gained from the following. Since the images of the cross wires

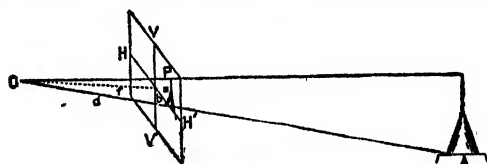


FIG. 1.

are photographed on the plate, every point of the field appears in its proper position in relation to the four quadrants of the plate. Thus, in Fig. 1 *HH'* is the image of the horizontal

wire, VV' the image of the vertical wire, and P the image of a church spire. The lines a and b can be measured in the photograph, and, the focal distance f being known, line d can be computed, and, when the distance OA has been determined from the map, the height of the spire above the level of the instrument is given by similar triangles. To plot a survey, the angular distance of any point from the base line is determined by a photograph taken at each end of the base. In Fig. 2 P represents the plate of the camera at station A ; B' , C'

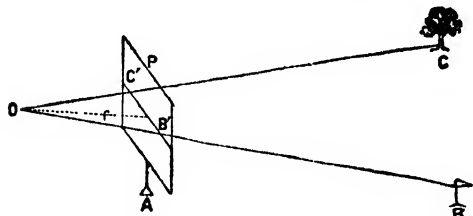


FIG. 2.

being the images of station B and the point C ; the angle $B'OC'$ can be determined from $B'C'$ and the focal length f . Then any point of the map may be plotted as follows: Lay off the base line to a desired scale and draw lines making angles with the base equal to those computed. These will intersect in a point on the map corresponding to the point in the field. See SURVEYING.

Bibliography. H. A. Reed, *Photography Applied to Surveying* (New York, 1888); E. G. D. Deville, *Photographic Surveying* (Ottawa, 1895); H. A. Reed, *Topographical Drawing and Sketching* (4th ed., New York, 1906); J. A. Flemer, *Elementary Treatise on Phototopographic Methods and Instruments* (ib., 1906); H. M. Wilson, *Topographic Surveying* (3d ed., ib., 1908); id., *Topographic, Trigonometric, and Geodetic Surveying* (3d ed., ib., 1912).

PHOTOGRAPHY. The art of producing the appearance of objects and fixing them by means of light on a previously sensitized surface, and the reproduction of the image thus obtained, by various processes, on glass, paper, or other materials. The first photographic camera was in reality a darkened room to which light was admitted through a single small hole in the window shutter. This was the "camera obscura" of Giambattista della Porta, an Italian philosopher, invented by him in the last half of the sixteenth century. When the sun shone brightly, a faint inverted image of a landscape could be seen on the whitened surface of the wall within. The camera obscura of the present time differs very little from Porta's invention, except that it contains a lens in the apex of the roof, with a reflecting mirror above it, in order to throw the light from all the surrounding landscape down through the lens and thus form a panorama on the surface of the table placed in the middle of the room. J. H. Schultze, a German, who has been called the Columbus of photography, obtained the first actual photographic copies of writing as early as 1727, by placing the written characters upon a level surface previously prepared with a mixture of chalk and silver nitrate. The rays of light passing through the translucent paper blackened the silver compound underneath, except where it was protected by the opaque ink

forming the letters themselves, and thus a white copy upon a black ground was obtained.

Scheele in 1777 demonstrated that silver chloride became black quickest by the action of the violet rays of the solar spectrum, thus showing that the rays of light were not equally active. A few years later Professor Charles projected the shadow of a head by means of strong sunlight on a sheet of white paper which had been made sensitive by chloride of silver and obtained a white profile on a darkened surface; but he was unable to fix the image upon the sensitive paper. Meanwhile the members of the Lunar Society, including Samuel Parr, James Watt, Josiah Wedgwood, and others, met regularly at the house of Matthew Boulton at Soho and discussed their experiments, some of which were on the action of light, and it has been shown that an artist named Eginton, in the employ of Boulton, made and sold numerous copies of well-known paintings at very low prices. Thomas Wedgwood, to whom is due the honor of being the first to produce pictures by the action of light on a sensitive surface, published his paper giving "an account of the method of copying paintings upon glass, and of making profiles by the agency of light upon nitrate of silver, with observations by H. Davy," in the *Journal of the Royal Institute* for June, 1802. To Davy credit is due for his discovery that silver chloride was more sensitive than the nitrate; but, notwithstanding his continued investigations, Davy was unable to find a means by which the fading out of the pictures could be prevented. Other investigators took up the subject later, among whom may be mentioned Joseph Niepce and Daguerre in France and William H. F. Talbot in England. The first named, in 1814, succeeded in producing permanent pictures by a process which he called heliography. It consisted in coating with bitumen a piece of plated silver or glass, which was then exposed in a camera obscura during four to six hours. Those portions of the bitumen which were acted on by the light became insoluble, and, by removing the parts unacted upon by certain essential oils in which bitumen was soluble, the shadows of the image were removed, and the lights were represented by the insoluble bitumen that remained on the plate. This process was therefore the forerunner of our modern photo-mechanical methods. In 1824 Daguerre began his experiments, which led to the invention of his celebrated process. He formed a partnership with Niepce in 1829, and 10 years later they announced the invention of the daguerreotype process, the principle of which had been discovered by Daguerre in 1832. The process consisted in exposing a metal plate covered with silver iodide for 20 minutes in a photographic camera, after which the plate was transferred to a dark room and exposed to the vapor of mercury, which developed the latent image, the latter being then made permanent by means of a solution of sodium chloride. Sir John Herschel, who devoted considerable attention to this subject, soon afterward announced the greater suitability of sodium hyposulphite for dissolving the haloid salts of silver; consequently the hyposulphite was adopted as a fixing agent. Daguerre received a pension of 6000 francs from the French government on Aug. 10, 1839, in consideration of which the details of his process were given to the world. Information of this invention reached the United States in

1839 through Samuel F. B. Morse, who communicated it to his colleague in New York University, John W. Draper (q.v.), by whom the first sunlight picture of a human face (that of his sister, Dorothy Draper) was made in 1840. Meanwhile Talbot in England had been pursuing investigations from a different viewpoint, and on Jan. 31, 1839, he presented before the Royal Society a paper on "Pathogenic Drawings." These he produced by dipping writing paper in a solution of sodium chloride, drying, and then transforming the sodium chloride into silver chloride by passing the paper through a solution of silver nitrate. With this paper, which was extremely sensitive to light, he was able to produce a negative that became black by the action of sunlight except where it was covered by some opaque object, which he desired to reproduce, and in turn from this negative, by another exposure, a number of positive prints could be obtained, which were fixed by potassium bromide. Two years later Talbot patented his "calotype" process, in which the negative was obtained by coating the surface of the paper with silver iodide, then washing it over with a mixture of silver nitrate with gallic and acetic acids, after which it was exposed in a camera to the object he wished to copy. The invisible picture thus obtained was developed by silver acetate and gallic acid and fixed with potassium bromide. Minor inventions and improvements followed the introduction of Talbot's process, among which the most important was the use of albumen, recommended by Niepce de Saint-Victor as a film containing haloid salts which he flowed upon the surface of the glass.

The development of the modern rapid processes of photography may be said to have begun with the introduction of the dry collodion process by Scott Archer in 1851. This process consists in coating glass plates with a film of collodion containing soluble iodides or bromides, which form a sensitive silver compound when dipped in a solution of silver nitrate. The soluble collodion is prepared by the action upon cotton of a mixture of nitric and sulphuric acids with a little water, or of a mixture of potassium nitrate with sulphuric acid, the resulting substance being dissolved in a mixture of alcohol and ether. On evaporation the viscous solution leaves a film of collodion. The exact proportions of the ingredients used must be varied at different seasons of the year and must be suited to the character of the objects to be photographed—one variety being suitable for landscape views, another for portraiture, etc. The collodion is flowed over the glass plate, which must be perfectly clean, and when partially dry sensitized by dipping into a bath containing silver nitrate in the proportion of from 35 to 50 grains of the salt to an ounce of water. A very small quantity of potassium iodide is added to the bath. The sensitized plate is then exposed in the camera to the object to be taken. The action of the light on the sensitive silver salts changes them in such a way as to produce a latent image on the film, which is then developed by pouring over the plate a solution of ferrous sulphate or pyrogallol acid, to either of which are added some alcohol and acetic acid, after which the image on the plate is made permanent or fixed by immersion in a solution of sodium hyposulphite, potassium cyanide, or some other liquid capable of dissolving the portion of the silver salts that has not been acted upon by

the light. For the protection of the collodion film it is common to coat the negative with a clear and hard varnish.

As the wet process required that the plates be prepared at the time of exposure, that process naturally found its most extensive employment for indoor work, and continual efforts were made to devise portable plates. Finally plates were introduced which were sensitized, washed, dipped in some organic preservative, such as a solution of tannin, and then dried.

In 1871 Maddox introduced the earliest form of the gelatin-emulsion process, which has since been considerably improved and is now used very largely. In this process the sensitive silver salt is held in suspension in either collodion or gelatin. The collodion emulsion may be made by dissolving in one portion of collodion a solution of zinc bromide, in another a solution of silver nitrate, and then thoroughly mixing the two portions. The gelatin emulsion may be prepared by bringing into solution the gelatin with potassium bromide, while a solution of silver nitrate to which some ammonia is added is gradually poured into the liquefied solution of gelatin. These emulsions are floated on plates and dried. Modern plates of this nature are found to be from 10 to 100 times more sensitive than the older wet plates and have thus made possible the photography of moving objects and of those which are only dimly lighted. They also make possible the flash-light pictures by means of which instantaneous views are taken of a dark interior during the burning of a small quantity of magnesium. A large variety of developing agents are employed with the modern dry plate. Pyrogallol acid in connection with an alkali is perhaps the most common. Sodium hyposulphite is almost entirely used as the fixing agent.

The camera consists of a box, either of wood or a framework of wood with a bellows-expanding body of leather, so that when closed the camera may occupy but little space and be conveniently carried. In the front of the camera is the lens, and at the back a piece of ground glass on which the image of the object to be photographed may be focused, together with an arrangement for lengthening or shortening the body of the camera. The camera should be placed so as to insure perfect rigidity when fixed and for indoor work should be strong and steady, while for outdoor photography the camera stand should be made light so as to be easily portable, or the stand or tripod may be dispensed with altogether.

The lens is of very ancient origin. There is a lens in the British Museum which was found in the ruins of Nineveh, and during the Middle Ages the manufacture and properties of simple lenses were well understood in Europe. In general use now, four varieties of lenses are common: (1) a single lens, consisting usually of a combination of two converging meniscus lenses separated by a diverging meniscus, arranged as a combination in the tube of the lens at the end nearest the camera, the convex side of the combination being towards the plate; (2) a rapid rectilinear lens, consisting of a converging meniscus lens cemented to a diverging meniscus, the latter occupying the outside position in the tube; (3) a wide-angle rectilinear lens, of somewhat similar construction, having two combinations formed of meniscus lenses, but of much deeper curvature than those employed in

other combinations and placed closer together in the lens tube; and (4) the portrait lens, consisting of a back and front combination, arranged at some little distance apart, the front combination containing a double convex and a plano-convex lens cemented together, the double convex lens taking the position next the object, while the back combination consists of a double convex and a diverging meniscus lens, which are frequently mounted so as to leave a small space between the two.

In photographing an object the camera is set up, and, after the image is properly focused on the ground-glass plate, the holder containing the sensitized plates, which are carried in double-backed dark frames arranged to carry two plates, each back to back, is inserted in the camera and the cover of the slide is withdrawn, exposing the sensitized plate so that it receives the picture. The shutter is then closed, and the cover of the dark slide placed over the plate, which is later taken to the dark room for development.

For the bringing out or developing, as it is called, of the latent image that has been produced on the sensitive plate, it is treated with various solutions; thus, in the daguerreotype the vapor of mercury is the agent used, and in the wet collodion process, as has already been mentioned, the development is effected by ferrous sulphate or pyrogalllic acid. In the case of the dry plates a developer, prepared by adding one part of a saturated solution of ferrous sulphate to four parts of a saturated solution of potassium oxalate, to which has been added a very small quantity of a solution of potassium bromide, is sometimes employed. A ferrous citro-oxalate is frequently used instead. As the plates are exceedingly sensitive, they must be developed in a dull ruby light, and the operation is accomplished by laying the plate in the developing tray, face upward, after which the liquid is run gently from one end of the plate to the other. Excellent results have also been obtained by the use of hydroquinone, eikonogen, metol, etc. These substances, when mixed with potassium bromide and sodium sulphite to act as reducing agents, produce very clear negatives. But pyrogalllic acid is still most largely used as a developing agent.

For the reproduction of printed copies from the negative, a paper sensitized by dipping in a solution of silver nitrate is employed and is then exposed to the sunlight, under the negative. The paper, which should be of some light and moderately strong quality, is first coated on the surface with a smooth layer of albumen to which either ammonium or sodium chloride has been added, and then floated in a solution of silver nitrate of varying strength, according to the condition of the negative, and of which 50 grains of the salt for every ounce of water is an average proportion. The exposure to light also varies according to the brightness of the light and the character of the negative. The print thus obtained is toned by immersion in a neutral solution of gold containing certain metallic salts, and finally the image is fixed by immersing the print in a solution of sodium hyposulphite which removes the unaffected silver salt. The final operation consists in thoroughly washing the print, after which it is ready for mounting.

The gradual disappearance or fading out of prints made with silver salts led to numerous attempts to find satisfactory substitutes, and

various metallic salts have been employed for the purpose of producing permanent prints, some of which are described in the following paragraphs.

Cyanotype, or Blue Prints. The earliest of these is perhaps the one first described by Sir John Herschel and consisting in the reduction of ferric salts by light. Solutions of one part each of ammonium ferric citrate and potassium ferricyanide in eight parts of water are made separately and then mixed in a dark room. The paper or cloth is floated on this solution and exposed under a negative to the action of sunlight and then thoroughly washed. This process is employed largely for copying plans by builders and architects, and the lines of the drawing appear white on a blue ground. It is much used on account of its cheapness and simplicity. A somewhat similar process, in which the ammonium ferric citrate is substituted by a solution of one part of uranium sulphate in four parts of water, yields a beautiful rich brown print.

Ferrotypes, or Tintypes. In this process a piece of sheet iron is japanned with black varnish and baked, after which it is sensitized with a collodion solution and exposed in a camera to the object, then developed and finally covered with some protective coating. See FERROTYPES.

Platinotype. The substitution of platinum for silver, originally introduced by W. Willis, has found considerable favor, owing to the fact that the prints are both richer and more permanent than those made with silver salts. The original process consisted in sensitizing the paper with a mixture of ferric oxalate and a platinum salt. Exposure to light resulted in the reduction of the ferric salt to the ferrous state, and when the ferrous salt was in solution the platinous salt was reduced by it. By floating the exposed paper on a solution of neutral potassium oxalate, which is a solvent for ferrous oxalate, the platinum salt in contact was immediately reduced to the metallic state and the image built up. Such prints were fixed by immersion in dilute hydrochloric acid, which dissolved any ferric oxalate or calcium oxalate that might be present. A second process has been introduced in which the paper is simply coated with ferric oxalate containing a small quantity of mercuric chloride, which after exposure is developed by a solution of potassium oxalate with the platinum salt. A still more recent method is one in which the paper is sensitized with a mixture of the platinum salt with sodium-ferric oxalate and sodium oxalate, and under the influence of light and the moisture of the air the reduction of the platinum salt takes place in the printing frame. Excellent results have been obtained by toning silver prints with platinum, which yields rich brown and black tones.

Photomechanical Processes. Methods by which photographic impressions could be reproduced by mechanical means and so used directly on the printing press have naturally been sought for and have been invented. Such processes depend for the most part upon the action of light on a gelatin film impregnated with a bichromate, generally of potassium or ammonium. The processes in question may be divided into two groups. In processes of the first group the picture is molded in gelatin and colored by a pigment. The group includes the woodburytype or photoglyph and the stannotype. In the woodburytype a sheet of bichromatized gelatin, a

highly sensitized mixture of gelatin and potassium bichromate, is prepared and a thin film exposed under a negative to a strong light and then washed to remove the unchanged gelatin that was protected from the light by the negative and finally dried. This film is placed upon a sheet of soft metal, usually lead, and forced into it by hydraulic pressure, producing a mold of the picture, in which the dark parts are in intaglio and the light ones in relief. This mold is then inked with a solution of warm gelatin colored with pigment and a sheet of paper laid upon it, a strong pressure exerted in a horizontal press, the excess of ink being forced out by pressure. The print is then immersed in a solution of alum, which renders the picture insoluble. The stannotype, which is a modification of the foregoing process, consists in substituting for the lead plate a thin sheet of tin foil properly strengthened in the back by electrotyping material. In the photomechanical processes of the second group the picture is printed with ordinary printing ink from a gelatin surface, from stone, from metallic-relief surface, or from an intaglio copper plate. The collotype or phototype processes of this group, in which the picture is printed from a gelatin surface, are represented by the albertype, invented by Joseph Albert, of Munich, in 1869. This process consists of coating a sheet of plate glass with a thin film of chromatinized albumen and gelatin, which is then laid face down on black cloth and exposed to light. The insoluble gelatin next to the plate adheres firmly to the glass and serves as a foundation for a second film, which consists of chromatinized gelatin. The dry film is placed under the negative in a printing frame and exposed to the light until the shades of the image are visible through the glass. Next the plate is washed in water to remove the soluble bichromate and the film hardened with chrome alum and dried. The plate is fastened to the bed of a printing press by means of plaster of paris. The artotype, which is similar to the foregoing, was invented in 1878. A mixture of albumen and soluble glass is used for the foundation, on which the sensitive film is afterward placed. As such a film does not require to be hardened by light, opaque metallic plates may be used instead of a glass plate, as in the previous process. Indotints or autoglyphs are produced by processes similar to the foregoing, except that the support for the gelatin film is usually of copper slightly roughened in order to cause the sensitive film to adhere firmly. The addition of alcohol to the chromatinized gelatin is said to increase the toughness and tenacity of the film. After exposure under the negative the unchanged bichromate is washed out and the plate is dried. Prints from such plates can then be taken on a power press. The heliotype process differs from the foregoing by the hardening of the gelatin film with chrome alum and the detaching of it from the support upon which it was first prepared; thus yielding, when completed, a thin sheet or skin of gelatin that is both tough and flexible, and which may be placed on a plate of zinc or attached to a cylinder when used for printing.

Excellent results in color have been obtained in the foregoing processes by preparing several gelatin plates, each of which corresponds to a different color in the original, and these are then used for printing with colored inks. Prints have been produced in which as many as seven

successive distinct colors have been used. In those processes in which the picture is printed from stone a sensitive mixture of albumen and ammonium bichromate in water is passed over a lithographic stone which has been thoroughly polished and cleaned. The excess is carefully rubbed off and the surface of the stone dried so as to remove all traces of moisture. It is then exposed under a negative, and wherever the light penetrates to the chromatinized albumen it becomes insoluble. After sufficient exposure the surface of the stone is covered with lithographic ink and washed with water so as to remove the soluble parts of the film and then treated with the acid and gummed and printed as in ordinary lithography. The difficulty in handling the heavy stones soon led to the invention of an improved process, in which a sheet of paper, sensitized with a solution of albumen, gelatin, and potassium bichromate, is placed face down on a sheet of smooth copper and then exposed under a negative, after which it was coated uniformly with the usual lithographic transfer ink. The paper is then floated on boiling water in order to coagulate the albumen on the film, and the unaltered gelatin which is protected by the opaque portions of the negative absorbs moisture and swells, leaving the unaltered gelatin depressed. This print, again washed and then dried, is transferred to stone by simply placing it upon that material face downward and passing it through the press.

Processes in which the picture is printed from a metallic relief surface include the ordinary photo-engravings or photo-electrotypes. In the former a plaster mold is taken of the gelatin film and a cast reproduced in type metal, when it is called a photo-engraving, or in copper, when it is known as a photo-electrotype. These include those processes of photo-etching in which the pictures are printed from zinc plates to which the design has been transferred in adhesive transfer ink from paper, similar to the transfer process referred to under LITHOGRAPHY, *Photolithography*. The zinc plate thus obtained is then treated with acid in order to lower the white portions, producing a low relief. See PHOTO-ENGRAVING.

Processes in which the picture is printed from an intaglio copper plate had their origin in France and were known variously as photogravures, photo-aquatints, etc. These consist of gelatin relief films similar to those of the woodburytype (see above), with certain modifications which caused the production of a grain in the relief film; thus, in the case of the photogravures of Goupil, the material producing this effect is said to be pulverized glass. A mold is then made from the gelatin relief, from which a copper plate is obtained by electrotyping, from which the prints are then carefully made.

The invention of a transparent and flexible film pellicle for supporting the sensitized photographic surface was made by Hannibal Goodwin, and his application for patent was filed May 2, 1887, but the patent was not issued until Sept. 13, 1898. The substance itself was entirely new, and the manufactured article consisted of a film support of a dried and hardened cellulosoidal solution of nitrocellulose. The film must be nongreasy, insoluble in developing fluids, insensible to heat and moisture, hard, smooth, brilliant of surface, exceedingly thin and light, and absolutely transparent. It was no easy matter to obtain all these properties in the new support,

and it is only after many years that the film has succeeded in supplanting to any great extent glass as a supporting substance. It was a very important invention and has made possible the widespread modern employment of photography by amateurs. The patent rights of the inventor were contested, and it was only after an extended patent litigation in the courts that the invention of Dr. Goodwin was finally upheld by the decision of Judge Hazel in the First District Court at Buffalo. The case was then carried to the Circuit Court of Appeals, and that court rendered its decision March 10, 1914, confirming the decree of the lower court. So was concluded the important litigation over this patent which had extended over a decade of years. The roll holder, by means of which a long strip of film can be carried in a comparatively small space, was first suggested by W. J. Stillman and has led to the modern hand camera for films, and later to the so-called system of daylight photography, which still further increased and simplified the use of photography by amateurs.

Applications of Photography. In addition to the production of pictures of persons and scenery photography finds extensive application in reproducing paintings and thus popularizing famous works of art. Photography is further employed in many branches of science. The microphotographs of minute forms of life have added much to our knowledge of such organisms, and the photographs of the heavens are furnishing innumerable data that will doubtless lead to astronomical generalizations of the greatest importance. (See **ASTROPHOTOGRAPHY**) The application of photography in legal matters for the purpose of showing forged signatures and establishing facts that were disputed has been of the utmost value. Photographs taken from balloons during the Boer War furnished information that proved of great value, and during the War of the Nations many air craft were equipped with photographic apparatus. The biographic pictures in which the effect of motion is reproduced in consequence of the successive exposure, occupying out a 250th part of a second, have brought about a revision of the opinion in regard to many forms of motion, the details of which can now be studied. And the employment of photography is constantly growing. The applications of modern instantaneous photography to the wide field of moving-picture shows is perhaps the largest and most popular. Photographic material has become an important item in international trade. The value of imports into and exports from the United States alone, including cameras and other apparatus, films and other sensitized goods, having been over \$12,000,000 in 1914. The United States is the world's largest manufacturer of motion picture films: the exports in 1914 amounted to 188,049,654 feet, of which 32,690,144 feet had been exposed, and 155,359,550 was unexposed and intended for use in photographic work in other parts of the world. The value of the motion picture films exported in 1914 was \$6,547,646. See **MOVING PICTURES**; **ROTOGRAVURE**.

Photography in Law. The courts have generally recognized that an accurate likeness of an object or place can be reproduced by means of the art of photography, and photographs are now often an efficient means of demonstrating a fact in the trial of a cause. They are admitted in both civil and criminal cases as an aid to the jurors in their efforts to understand descriptions

of places and objects which might not otherwise be presented in an intelligible manner.

By the general weight of authority a photographer has no right to print copies from a negative likeness of a person, for his own use or distribution in any way, without the person's consent. The person whose likeness is thus taken may restrain the sale of his photographs and recover such damages as he may have sustained by reason of the sale of the copies. This is generally placed on the ground of implied contract and sometimes of breach of confidence. The photographer owns the negative, but the person whose likeness is on it has the right to say whether it shall be used or not for public or advertising purposes.

Bibliography. The literature of photography is so extensive that mention can be made of but few of the many works dealing with the subject in its different aspects. In fact, many of the authorities have prepared a number of works each of which discusses a single process or phase of the subject, and these should be consulted by the reader in search of information. The works of Abney, Robinson, Vogel, Eder, and Burton are all authoritative and valuable. The following works will doubtless be of service to the reader, although it must be understood that such a list is by no means comprehensive: General: Alfred Brothers, *Manual of Photography* (2d ed., Philadelphia, 1899); W. de W. Abney, *Treatise on Photography* (11th ed., ib., 1901); Walter Kilbey, *Hand Camera Photography* (New York, 1903); L. W. Brownell, *Photography for the Sportsman Naturalist* (ib., 1904); C. H. Hewitt, *Professional Photography* (2 vols., ib., 1904); Chapman Jones, *Science and Practice of Photography* (ib., 1905); W. de W. Abney, *Instruction in Photography* (11th ed., Philadelphia, 1905); Louis Derr, *Photography for Students of Physics and Chemistry* (New York, 1906); Beck and Andrews, *Photographic Lenses* (New York, 1908); Charles Holme (ed.), *Colour Photography* (ib., 1908); W. I. L. Adams, *Photographing in Old England* (ib., 1910); id., *Sunlight and Shadow* (ib., 1912); Alfred Watkins, *Photography: Its Principles and Application* (ib., 1911); E. O. Hoppé and others, *Photography* (ib., 1911); H. C. Jones, *Photography of To-Day* (Philadelphia, 1912); G. W. Hance, *Commercial Photography of To-Day* (Cleveland, 1914). History: Eliza Meteyard, *Group of Englishmen . . . Records of the Younger Wedgwoods . . . and the Discovery of Photography* (London, 1871); George Iles, *Flame, Electricity, and the Camera* (New York, 1900); C. R. Gibson, *Romance of Modern Photography* (Philadelphia, 1908); A. E. Garrett, *Advance of Photography* (New York, 1912). Optics: R. S. Cole, *Treatise on Photographic Optics* (ib., 1899); Otto Lummer, *Contribution to Photographic Optics* (ib., 1900); Carl Zeiss, *Photographic Objections and Photo-Optical Auxiliary Appliances* (Jena, 1901); H. D. Taylor, *System of Applied Optics* (New York, 1906). Process: H. O. Klein, *Collodion Emulsion* (ib., 1905); Arthur Whiting, *Retouching* (ib., 1906); Sheppard and Mees, *Investigations on the Theory of the Photographic Process* (ib., 1907); Arthur Payne, *Wet Collodion Process* (ib., 1907); I. L. Hower, *Art of Retouching Systematized* (Chicago, 1908). Composition: O. W. Beck, *Art Principles in Portrait Photography* (New York, 1907); Sadakichi Hartmann, *Composition in Portraiture* (ib., 1909); id., *Landscape and Figure Composition* (ib., 1910);

A. J. Anderson, *Artistic Side of Photography in Theory and Practice* (ib., 1911); P. L. Anderson, *Pictorial Landscape Photography* (Boston, 1914). Encyclopedias, etc.: W. E. Woodbury, *The Encyclopædic Dictionary of Photography* (New York, 1896); John McIntosh, *Photographic Reference Book* (ib., 1905); Etheldred Abbot, *List of Photographic Dealers, with Index by Countries* (Brookline, Mass., 1907); B. E. Jones, *Cassell's Cyclopædia of Photography* (New York, 1911); E. J. Wall, *Dictionary of Photography* (London, 1912). Current periodicals: *American Photography* (Boston); *Photo-Era* (ib.); *American Annual of Photography* (New York); *Camera Work* (ib.); *Photo-Miniature* (ib.); *Photographic Times* (ib.); *Photographic Journal of America* (ib.); *Bulletin of Photography* (Philadelphia); *The Camera* (ib.); *Amateur Photographer and Photographic News* (London); *British Journal of Photography* (ib.); *Camera Craft* (ib.); *Chemical News* (ib.); *The Optician* (ib.); *Photography and Focus* (ib.).

PHOTOGRAPHY, STELLAR. See ASTROPHOTOGRAPHY.

PHOTOLITHOGRAPHY. See LITHOGRAPHY, *Photolithography*.

PHOTOMETRY (from Gk. *phōs*, *phōs*, light, + *-metra*, *-metria*, measurement, from *μέτρον*, *metron*, measure). The science of comparing the intensities of sources of light. It has not been possible up to the present time to measure the intensity of a source of light in terms of any absolute standard, i.e., in terms of watts, and therefore it is customary to compare the intensity with that of a standard source of light, and for this purpose various standards of white light have been proposed and used, but none have been completely satisfactory. These will be found discussed below. Experiments are now in progress, however, which may reduce photometry to an exact science. The intensity of any source of light is defined to be the amount of light emitted through a cone whose solid angle is unity; its numerical value is given in terms of *candles* or other standards. (See below.) The *flux of light* is the amount of light emitted through a solid angle of any size; its unit is called a *lumen*. The illumination of any illuminated surface is the flux of light falling upon it divided by its area; its unit is the *lux*, i.e., this is the illumination of a plane surface at a distance of 1 meter from a standard candle when the light falls perpendicularly upon the surface. The *brightness* of a source of light, if it is a surface, is the intensity divided by the area of the surface. Consult an article by Crew, *Astrophysical Journal*, vol. vii, p. 298 (1898).

If a surface is illuminated by a small source of light, its illumination varies directly as the intensity of the source and inversely as the square of its distance from the surface. (See LIGHT.) The intensities of two sources may be compared, therefore, by allowing two portions of the same surface to be illuminated by them. If the illumination over these two portions is the same apparently to the eye, the intensities of the two sources are in the same ratio as the squares of their distances from the surface. Several devices have been invented to secure the illumination of two portions of the same surface by the two sources. These instruments are known as photometers and are described below. The problem of comparing two colored sources of light, or of comparing the intensities of the colors produced by two sources

of white light when dispersed by a prism, is virtually the same as that just discussed, but it requires a photometer adapted for this purpose. See SPECTROPHOTOMETRY.

Photometers. Most photometers are based on the law of the inverse squares and enable us to compare the relative intensities of two lights by finding at what distance they furnish equal illumination. There are also other photometers, but those depending on the equality of illumina-

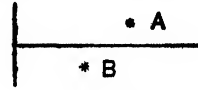


Fig. 1.

tion are by far the most extensively employed. The earliest photometer was devised by Bouguer and consisted of a vertical screen at right angles to a partition. On either side of the partition was placed a light so that it would illuminate one side of the screen. These lights were then adjusted until the two halves of the screen appeared of equal brightness. The distances of the lamps or lights from the screen were measured, and a proportion was formed according to the law of the inverse squares. The screen, which was at first opaque, in later instruments was supplanted by one of ground glass, oiled paper, or other translucent material. An instrument based on the same principle, which is in some respects modified, is shown in the accompanying diagram (Fig. 2). Here A and B are the two illuminants, as before, and the rays of

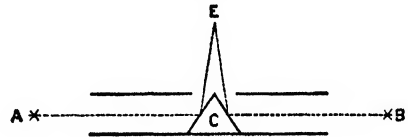


Fig. 2.

light fall on the surfaces of the prism C. The two lights are moved so that the surfaces of the prism appear equally illuminated to the eye of the observer at E. A simple and effective photometer was devised by Lambert in 1760; but as it was used extensively by Rumford some years later, it is known by his name. It consists of a vertical screen with a white surface, in front of which stands a cylindrical stick. The lights

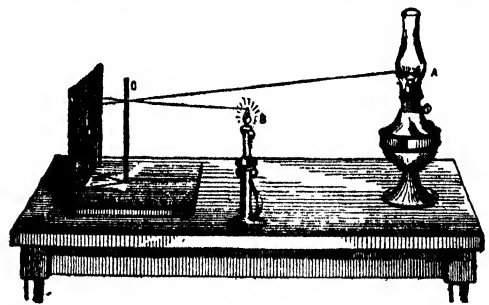


FIG. 3. RUMFORD PHOTOMETER.

to be compared are placed in front of this stick, so that each will cast a shadow on the screen. These shadows represent the amount of light furnished by but one of the sources; consequently, by varying the distances of the lights from the screen, a position can be obtained

where they furnish shadows of equal intensity. Measuring the distance of the lights from the screen, squaring these numbers, and forming a proportion, we can again compare the intensity of the two illuminants. A second screen with an aperture cut in it may be placed parallel to the first with the lights in front of it and some little distance apart, so that each illuminates the screen by means of rays sent through the aperture. The two separate spots of light on the screen can be made equal by adjusting the lights and their comparative intensity computed as before. The photometer in most general use is that of Bunsen, where the two lights to be compared, *A* and *B*, are placed at the opposite ends of the apparatus and a screen, *C*, whose face is perpendicular to the incident rays can be moved to and fro between them. This screen is made of a sheet of white paper, with a central spot,

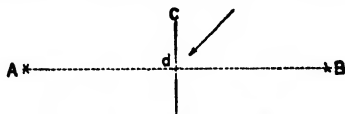


FIG. 4. BUNSEN PHOTOMETER.

d, produced by oil or grease, which appears bright on a dark ground by transmitted light and dark on a light ground by reflected light. When the transmitted and reflected lights are equal in intensity, the spot should disappear and the surface of the paper appear uniform, but in actual practice this condition is not realized. The usual form employed is a modification known as the Leeson disk, where accurately matched ring or star-shaped apertures of opaque paper are pasted on the opposite sides of a sheet of translucent paper. The disk should be available either for equality of brightness or equality of contrast. The paper screen is usually mounted in a box or carriage with mirrors or prisms enabling the observer to see simultaneously both sides of the paper and is moved along a scale between the two lights, which is either graduated in units of length or indicates candle power direct. The reading is taken when the spot disappears as nearly as possible, and the candle power or relative intensity is determined as in the other cases. The arrangement of the lights, of course, varies in different forms of the instrument, as does also the construction of the box carrying the screen, but in general the results do not possess a greater accuracy than 4 or 5 per cent. The Rumford photometer cannot be depended upon closer than 8 or 10 per cent, but in all classes of photometric work much depends on the observer.

The most modern and accurate photometer for use with two light sources of the same color is that of Lummer and Brodhun, in which the central spot disappears entirely when the lights are of equal intensity. This is accomplished by the use of two right-angled prisms—one, *E*, with its hypotenusal face plane, the other, *F*, with this face ground spherical except in the centre, where a circular spot is perfectly plane. The two prisms are then placed with their hypotenusal sides adjacent, but separated except at the centre, where the plane ground surface of the second prism is in contact with that of the other. The lights are placed at opposite ends of the apparatus, as in the case of the Bunsen photometer, and the rays fall on a central opaque screen, *C*, from which they are reflected to mirrors, *D* and *D'*, and then to the faces of the prism. The rays

from *B* entering the prism *F*, which has a spherical surface, undergo total reflection, except at the central portion, *d*, where the glasses are in contact. Therefore, only the rays passing

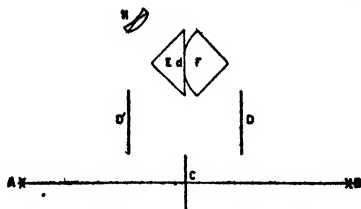


FIG. 5. PLAN OF LUMMER-BRODHUN PHOTOMETER.

through this central portion enter the second prism, *E*, and produce a spot of light of elliptical shape on its opposite surface. The rays from the other source of light, *A*, are reflected into the prism *E* and by total reflection at the hypotenuse are brought to the third face of the prism, except those falling on the surface of contact, which enter the prism *F*. Consequently we have the surface of the prism *E* nearest the observer illuminated in part by the rays from one source of light and in part by rays from the other. If the illuminant to the left of the observer, e.g., is of greater intensity, then we have a bright spot on a dark ground and reversing the conditions the dark spot surrounded by light. When the lights are of equal intensity, the spot entirely disappears and the field is uniform. The Lummer-Brodhun screen is usually

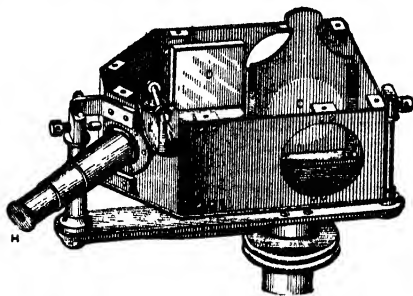


FIG. 6. LUMMER-BRODHUN PHOTOMETER.

mounted on a carriage which can be moved along a scale and which is easily reversed as a check on the observations. It has also a telescope, *H*, to observe the surface of the prism, which is a distinct advantage, as it permits the use of one eye and enables the observer to decide more accurately when the spot disappears, though the Bunsen and Leeson types, being binocular, are less fatiguing for a number of observations, though less sensitive.

Another photometer which has within recent years come into general use is called the *flicker photometer*; and it has the great advantage of permitting a comparison of two light sources of different colors. It was devised by O. N. Rood in 1893 and since then has been greatly improved by Whitman and others. If a surface is illuminated first by one source and then by another, at very close intervals of time, it will appear to the eye to be uniformly illuminated if the two sources produce equal illumination; whereas, if they do not, there will be a flicker. Rood showed that this fact is independent of the colors of the two sources. In practice there are two adjacent

surfaces—one illuminated by one light source, the other by the second source; this double surface is viewed through a prism, so that for one position one of the two surfaces is seen and for another position of the prism the other surface. Then the prism is made to move rapidly, so that the eye sees the two surfaces in rapid succession. One of the light sources is then moved away from or towards its illuminated surface until there is no flicker. There are certain conditions for the accurate use of the instrument, but these are not difficult to secure.

There are various portable photometers, modified from the various standard forms. Of these the Weber, making use of a small calibrated standard incandescent electric lamp and a Lum-

mer-Brodhun prism device, is used in Europe, but it did not appeal to scientific men universally as an accurate standard. Candles have been used for a number of years as standards in spite of their many shortcomings, and we are now accustomed to have our electric and other lights rated in candle power. The candle in use in the United States and England for photometric tests is the standard spermaceti candle, which burns 120 grains of material per hour and six of which weigh one pound. When this is prepared according to certain specifications as to size and form of wick and burns with a flame 45 millimeters in height, the light emitted is considered unity; but experience has proved that it is not possible to make candles sufficiently alike for scientific purposes. The stearin star

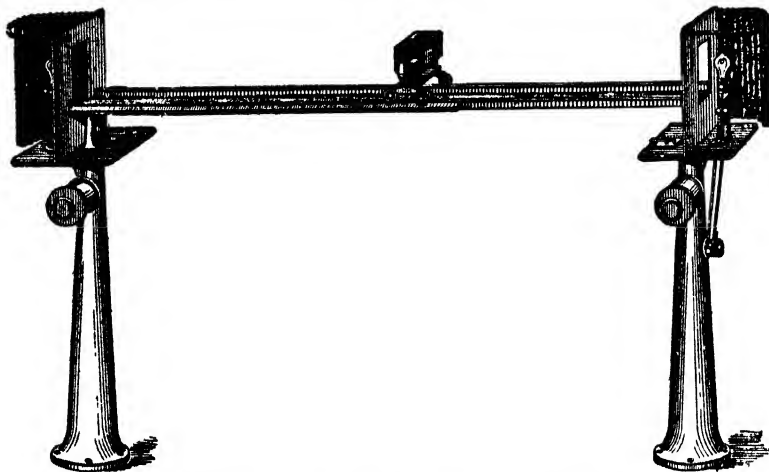


FIG. 7. LUMMER-BRODHUN PHOTOMETER ARRANGED FOR TESTING INCANDESCENT ELECTRIC LAMPS

mer-Brodhun prism device, is used in Europe and in the Sharp-Millar and Macbeth photometer in the United States, where the more precise instruments are known as illuminometers. It has a range from 0.004-foot candles to 2000-foot candles.

Brief mention should be made also of integrating photometers where the mean spherical or mean hemispherical intensity can be measured. In other words, such an instrument enables an observer to determine at a single observation the total flux of light from a source of illumination. Such photometers are maintained at the United States Bureau of Standards and at some of the more important testing laboratories.

Standards of Light. The question of standards of light possesses an intimate and important connection with photometry and is a subject which is still attracting much attention from physicists. Until the International Congress on Electrical Units in 1883 adopted as the absolute standard the amount of light emitted by a square centimeter of melted platinum at the point of solidification, there was no really scientific unit in general use. This is known as the Violle standard and it has not proved to be sufficiently reproducible for exact work. Numerous forms of candles and lamps were employed, but little reliability could be placed on the results obtained in such tests, and they did not form a satisfactory basis for subsequent or independent determinations. In France the standard used in photometric tests was the Carcel lamp, which burned purified rapeseed oil. The lamp was constructed according to certain fixed specifications,

candle was used in France and a somewhat similar candle in Germany, while a paraffin candle known as the Vereinskerze on account of its being adopted by the Union of German Gas Men was used in Germany and Austria-Hungary. The standard now commonly used in Germany is the acetate of amyl lamp of Hefner. In 1909 there was an international agreement by which the pentane lamp of England, the decimal candle of France, and the American candle were adjusted to be equal, and each to be equivalent to 1.11 Hefner candles of Germany. In practical photometry secondary standards consisting of incandescent lamps which have been standardized by comparison with some fundamental standard are used, and ordinary lamps are tested by reference to them. Two other types of standards have been proposed within the past few years, and they are in many respects a great improvement on the earlier ones. Nutting, Steinmetz, Ives, and others have advocated the adoption of the light from a vacuum tube through which an electrical discharge is passing; this light is, of course, discontinuous, consisting of a number of isolated colors. This is a disadvantage, but not a fatal one. In 1908 Waidner and Burgess, of the National Bureau of Standards, proposed the adoption as a standard (either of white or of monochromatic light) the intensity of the light emitted by 1 square centimeter of a black body at the temperature of the solidification of platinum (this is approximately equivalent to 88 Hefners). This standard is by far the best proposed. See **ASTROPHYSICS; ILLUMINATION; LIGHT.**

Bibliography. Adrien Palaz, *Treatise on Industrial Photometry*, translated by G. W. Patterson (2d ed., New York, 1896); F. L. Tufts, *The New Flicker Photometry* (ib., 1897); W. M. Stine, *Photo-Metrical Measurements* (ib., 1900); International Congress of Physicists, *Records, 1900*, vol. i (Paris, 1901); E. L. Nichols, "Standards of Light," in *International Electrical Congress, Transactions*, vol. ii (St. Louis, 1904); Waidner and Burgess, in *Electrical World*, vol. lii (New York, 1908); C. H. H. Stone, *Practical Testing of Gas and Gas Meters* (New York, 1909); W. E. Wickenden, *Illumination and Photometry* (ib., 1910); Hermann Bohle, *Electrical Photometry and Illumination* (Philadelphia, 1912); W. E. Barrows, *Light, Photometry, and Illumination* (New York, 1912); Uppenborn-Monasch, *Lehrbuch der Photometrie* (Munich, 1912). Also the *Transactions of the Illuminating Engineering Society*, *Bulletins of the United States Bureau of Standards* (Washington), and the files of the *Electrical World* for current developments.

PHOTOMICROGRAPHY. See MICROPHOTOGRAPHY.

PHOTOPHONE (from Gk. *phōs*, *phōs*, light + *phōnē*, *phōnē*, voice), or **RADIOPHONE**. The invention of the photophone arose from the employment by Willoughby Smith of selenium (q.v.) as a resistance medium in testing submarine cables in 1873. It was found that the electrical resistance of selenium varied considerably under the influence of light. Werner Siemens (in 1875) produced some extremely sensitive varieties of selenium, and in some of his experiments the resistance on exposure to light was found to be only one-fifteenth of what it was in the dark. Prof. Alexander Graham Bell (q.v.) substituted the telephone for the galvanometer and used intermittent flashes of light to produce a succession of changes in the conductivity of the selenium, corresponding in frequency to the musical vibrations within the limits of hearing. He perceived that the effect could be produced at the extreme distance at which selenium would respond to the action of a luminous body, and that this distance could be indefinitely increased by the use of a parallel beam of light, so that it would be possible to telephone from one place to another without a conducting wire. A form of photophone was devised in which light reflected from a plain mirror or flexible material, such as silvered mica or a microscope-cover glass, against the back of which the speaker's voice is directed, was caused to vibrate with a frequency corresponding to that of the diaphragm itself. A large beam of sunlight or any other powerful light is concentrated by means of a lens upon the diaphragm mirror, which after reflection is again rendered parallel by means of another lens. The beam is received at a distant station upon a parabolic reflector, in the focus of which is placed a sensitive selenium cell, connected in a local circuit with a battery and a telephone. This method of communication was first demonstrated by Bell and Tainter in 1880 at Washington over a distance of 213 meters. At Chicago in 1893 at the Exposition Bell exhibited an arrangement where for a receiver he employed a thermophone or small blackened sphere on which the interrupted rays fell. In later experiments by Ruhmer and others use was made of selenium cells in connection with a so-called speaking arc, and sound was transmitted over 9 miles.

Subsequent experiments by Professor Bell with

an interrupted beam of light and different fibrous and porous materials, such as cotton wool, worsted, silks, sponge, lampblack, etc., indicated that lampblack may be substituted for selenium in an electrical receiver. In France M. Mercadier passed an intermittent beam from an electric lamp through a prism and found a difference in the audible effects in different parts of the spectrum. These experiments were repeated by Professor Bell, who ascertained that sounds were obtained in every part of the visible spectrum excepting the extreme half of the violet, as well as in the ultra-red. Professor Bell constructed an instrument for use in spectrum analysis, which he termed a spectrophone. The eyepiece of a spectroscope was removed, and sensitive substances were placed in the focal point of the instrument behind an opaque diaphragm containing a slit. These substances were put in communication with the ear by means of a hearing tube, and if the interior of the spectrophonic receiver is smoked and the cavity filled with peroxide of nitrogen gas, we have then a combination that gives us good sounds in all parts of the spectrum, visible and invisible, except the ultra-violet. A rapidly interrupted beam of light is passed through some substance whose absorption spectrum is to be investigated, and bands of sound and silence are observed upon exploring the spectrum, the silent positions corresponding to the absorption bands. The method was not intended to supplant ordinary methods of spectrum analysis, but Professor Bell thought that in the invisible part beyond the red the method might be applicable. Consult A. G. Bell, *The Photophone* (Washington, 1878), and Ernst Ruhmer, *Drakhtlose Telephonie* (Berlin, 1907). See SELENIUM; WIRELESS TELEPHONY.

PHOTOPLAY. See MOVING-PICTURE PLAY; MOVING PICTURES.

PHOTOSCULPTURE. An ingenious use of photography to assist a sculptor in modeling portrait statues or facsimiles and reduced reproductions of other statues. This is accomplished by taking a number of photographs from different points of view and transferring the outline of these by means of a pantograph to the marble or clay. The device was invented in 1861 by Villème in Paris and has since been improved in Germany and by Carlo Base in Florence; but it has been replaced in later years by the pointing machine. See SCULPTURE.

PHOTOSPHERE (Gk. *phōs*, *phōs*, light + *sphaîra*, *sphaîra*, sphere). The visible surface of the sun, and the source of most of the light and heat radiated by that body. The spectroscopic shows that it is composed of highly incandescent vapors which float on the less luminous gases forming the body of the sun. When examined through the telescope, the photosphere presents a mottled appearance, due to the presence of bright spots which are differentiated into nodules and faculæ. The latter are usually found near sun spots, and are merely portions of the photosphere raised above the general level of the surface so that their brilliance is less dimmed by the absorption of the gases in the solar atmosphere.

PHOTOSTAT. A trade name for a special photographic camera with self-contained developing and fixing arrangements, designed for the direct and rapid photographing of printed or written documents, maps, drawings, records, etc., directly on the surface of a specially sensitized

paper without a reversal of the image, and producing a clear record in white on a black ground. It consists of a camera with bellows extension for focusing, a special copying lens, a total-reflection prism for correcting the image so that it will not be reversed as in an ordinary negative, a light-tight magazine for carrying a roll of the sensitized paper, devices for rolling and cutting off the prints as they are exposed, developing pan and slide to develop the print as it is cut off, and a fixing tray for finishing the exposed and developed print. The instrument is self-contained and can be readily operated, so that it is particularly serviceable in a large establishment or a library, where documents must be copied with accuracy. Thus, certain insurance companies make photostatic copies of their original policies for record, and maps and plans can be reproduced at any scale desired.

PHOTOSYNTAX (from Gk. *phōs*, *phōs*, light + *suntaxis*, *synthesis*, arrangement). The first special term proposed (1893) to designate the process of the manufacture of carbohydrate food by green leaves under the influence of light. See PHOTOSYNTHESIS.

PHOTOSYNTHESIS (Neo-Lat., from Gk. *phōs*, *phōs*, light + *sunthesis*, *synthesis*, combination). The process by which the green parts of plants construct carbohydrates under the influence of light. Carbohydrates are substances like sugars, starch, etc., which serve as the most important foods, both for plants and animals. The process may be conveniently treated under the following heads: (a) raw materials; (b) machinery; (c) energy; (d) products; (e) effect of external conditions; (f) cosmic significance.

(a) The raw materials for the process are carbon dioxide and water. Since the carbon dioxide and water unite when the former goes into solution in the latter ($H_2O + CO_2 = H_2CO_3$), they are furnished to the chloroplast as carbonic acid. The entrance of the carbon dioxide into the plant, as such, or in the form of carbonic acid, is in strict obedience to the laws of diffusion, the movement being towards the regions of consumption or lowest concentration. In submerged water plants the carbonic acid is taken from the bathing water. In land plants the carbon dioxide is obtained almost exclusively from the air, and the water from the soil. In these plants the amount of water used in photosynthesis is almost negligible as compared with the loss by transpiration. Land plants lacking stomata and highly cutinized surface walls absorb carbon dioxide on the entire air-exposed surface, while those with stomata take in the carbon dioxide almost exclusively through them. In the latter case the carbon dioxide diffuses as a gas through the stomata and intercellular spaces. It goes into solution on the moist surfaces of the walls facing these spaces, and from here diffuses as carbonic acid to the chloroplasts. The total stomatal openings do not usually equal 1 per cent of the total leaf surface, and are frequently very much less than this, while the partial atmospheric pressure of carbon dioxide is very low, averaging about 0.03 per cent of the total atmospheric pressure. It long puzzled plant physiologists to explain how enough carbon dioxide to account for the very considerable fixation occurring in the plant could be taken up through this small total opening from such a dilute atmosphere. This was later cleared up by showing that so multiperforate a system as is presented by the cuticle, stomatal system, and aëration sys-

tem of the leaf is about as efficient in gas absorption as if the whole leaf surface were open. The carbon dioxide supply of the air, as determined by fixation on the one hand and release on the other, is a matter of great interest in this connection. It has been estimated that the carbon dioxide supply in the air over each acre is about enough to produce four 100-bushel crops of corn, and that if the land surface of the earth were entirely seeded with vigorous sunflowers, they would consume all the carbon dioxide in the air in 50 months. This shows the necessity for the other phase of the carbon cycle, carbon dioxide release. The two great carbon-dioxide-forming processes are respiration and fermentations of plants and animals and the burning of carbon compounds. The total atmosphere contains approximately 2,500,000 billion kilograms of carbon dioxide. Mankind produces by respiration about 439 billion kilograms a year. The coal burned in the United States in 1907 produced about 727 billion kilograms. These two sources alone produce about 0.0005 of the total content of the atmosphere in one year. The most stable forms of carbon compounds made by plants are cellulose, wood, and suberized or cutinized walls. Fortunately there are many microorganisms in the soil that decompose the first two, and the last two are probably the main source of coal, from which carbon dioxide is being rapidly released by the agency of man.

(b) The chloroplast (q.v.) is the organ for photosynthesis and chlorophyll (q.v.) is the pigment essential for the process. Xanthophyll and carotin (q.v.), which always accompany chlorophyll in the plastid, are evidently not capable of carrying on photosynthesis; if they bear any part in the process it is the protection of chlorophyll against destruction by light. It has been asserted that other pigments, the blue, brown, and red of various algae and the purple of certain bacteria, are effective in photosynthesis, but late work renders this view doubtful. It is not known how chlorophyll makes light effective in decomposing carbonic acid, a capacity it lacks in the absence of this pigment. It has been suggested that it acts as a sensitizer, just as certain aniline dyes render the photographic plate sensitive to the longer rays of the spectrum. It has been suggested also that it acts in a photodynamic manner, as is common for many pigments showing fluorescence. This is shown by the fact that many such pigments are toxic to protoplasm in light but innocuous in darkness.

(c) The source of energy for photosynthesis, which is a reduction and endothermic process, is

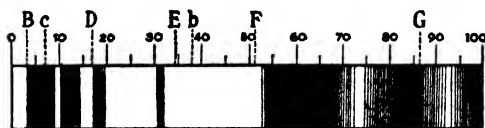


FIG. 1. THE ABSORPTION SPECTRUM OF CRUDE CHLOROPHYLL.

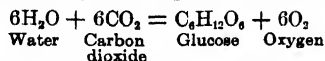
The most important absorption bands are the three regions near the B, c, and D lines. The absorption to the right of the F line is faint and not easy to resolve into three bands.

the visible portion of the solar spectrum. Neither the ultra-violet nor the infra-red, representing about 63 per cent of the solar energy, is effective. Of the visible spectrum only the portion of the light that is absorbed by chlorophyll is

available. The accompanying figure shows the absorption bands of an alcohol extract of leaves. Such an extract contains, in addition to chlorophyll, xanthophyll and carotin, which increase somewhat the absorption to the right of the F line; yet this spectrum, on the whole, is very similar to that of pure chlorophyll. Of the rays absorbed not all are equally effective in photosynthesis. Earlier work claims two photosynthetic maxima, the main one in the red near the B line, and another in the blue near the F line. These measurements are not satisfactory, for no account was taken of the amount of energy furnished by different portions of the spectrum. Later measurements, using the red-yellow (620 μ to infra-red), blue violet (509 μ to ultra-violet), and green (512–524 μ), all of equal energy, found the first two equally effective and the last entirely ineffective. In nature, owing to the preponderant energy of the red-yellow, it is of greatest significance in the process. In contrast we have the blue-violet of almost exclusive significance as a growth and movement stimulus in plants. It is asserted that the direct sunlight incident at right angles to the plane of the leaf can be reduced to one-twelfth without showing any mark of reduction in photosynthesis in the ordinary mesophytic leaf. The minimum light intensity necessary for photosynthesis must vary with different plants, but there are many difficulties in the way of determining it accurately. While sunlight is the main source in nature, artificial lights of various kinds are efficient in proportion to their intensity. Horticultural experiments in the United States and England have shown that electric light may be used for forcing certain plants in winter to a more vigorous development of foliage and vegetative organs. See ELECTROCULTURE OF PLANTS.

Scarcely any two cells of the plant receive the same amount of light. Those, therefore, that lie on the upper side and are first reached by the light are in the most favorable position for photosynthesis. As many as possible are developed by leaves in this position. Indeed, the palisade region (see LEAF) depends for its mode of development on the action of light. The internal cells, receiving only that which has passed one or more external layers, work at a slower rate, although they are usually better situated for receiving an adequate supply of carbon dioxide.

(d) Under the products of photosynthesis may be first considered the by-product, oxygen. Since in the process carbohydrates are made from water and carbon dioxide, the reaction may be represented by the empirical formula



According to the formula, there should be the same volume of oxygen produced as of carbon dioxide consumed, and the ratio $\frac{\text{O}_2}{\text{CO}_2}$ should equal

1. As a matter of fact this ratio is usually somewhat greater than 1 (about 1.06), and in succulents it may under certain conditions have a value of 1.28. The high value of this quotient results from other carbon dioxide and oxygen producing and consuming processes going on in the plant simultaneously with photosynthesis. In the first case it probably results from the formation of such reduced substances as fats from carbohydrates, and in succulents from the respiration of oxygen-rich organic acids in the

sunlight. Many attempts have been made to follow the processes and intermediate products involved in the building up of carbohydrates, but our knowledge here is still very unsatisfactory. It seems, however, that it is a very complex process, involving many reactions and intermediate products. Sachs spoke of starch as the first visible product of photosynthesis. We now know that starch forms only after the accumulation of considerable soluble sugar in the most marked starch-depositing forms, such as the pulse and the nightshade families, and that it never forms in natural conditions in certain representatives of the lily family. In the latter forms, however, it can be forced to form by soaking the organs in 20–25 per cent sugar solution. Starch, therefore, is a secondary product of photosynthesis, somewhat as are cellulose, hemicellulose, wood pectin; and it is usually preceded by soluble sugars, glucose or cane sugar. Von Baeyer held that formaldehyde is an early intermediate product in photosynthesis and that this is condensed to sugar. Much evidence, though none of it is conclusive, has accumulated for this view, and it has become customary to think of the process as occurring in two important steps—reduction of carbonic acid to formaldehyde, the endothermic or energy-storage step; and the condensation of formaldehyde to glucose, a slightly exothermic process. Undoubtedly each of these general steps involves several intermediate steps and products. The main evidences that formaldehyde is an intermediate product in the process are (1) it is found in living green tissue and even chlorophyll extract when these are illuminated in the presence of carbon dioxide; (2) though toxic in considerable concentrations, in low concentrations it can be transformed by green living tissue into carbohydrates; and (3) formaldehyde as an intermediate step is the natural course of transformation on the basis of chemical knowledge.

(e) There are a number of factors that jointly control the rate of photosynthesis. Each of these factors varies considerably in significance and in its cardinal points with different ecological plant groups. For the temperate-zone mesophyte the following statements summarize the effects of the main factors, with higher temperatures (25° C.) and higher light intensities the rate of photosynthesis increases as the carbon dioxide concentration of the air rises to several times that of the normal atmosphere. This shows that the carbon dioxide supply limits the rate of the process in nature under good temperature and light conditions. In good illumination and high carbon dioxide supply the rate of the process rises with the temperature from 0° C to 25° C., with a coefficient of about 2.6 for 10° C. rise in temperature. This is similar to the effect of temperature upon the rate of chemical reaction in a test tube, indicating the essential chemical nature of the process. At temperatures higher than 25° C secondary injurious effects of temperature set in. This breaking point for temperature is probably considerably higher in tropical forms and succulents. In favorable temperatures and carbon dioxide supply the rate of the process rises with the light intensity up to that approaching full diffuse daylight. Gorging of the leaf with organic material owing to long-continued photosynthesis reduces the rate of the process.

(f) From the cosmic side photosynthesis has two points of great significance. It is the main

primary source of organic foods for all plants and animals, both as building and as respiratory and fermentative material. It is the source of the great part of the latent energy liberated and used in the physiological processes of the world and in the physical processes carried on by man. These points are well illustrated by the facts that fats, proteins, and all other natural organic materials have their carbon source in carbohydrates and that the energy of coal and wood is that rendered potential by this process. While chemosynthesis is in certain respects coordinate with photosynthesis as a cosmic process, the amount of organic food of this origin is insignificant, and the energy used in chemosynthesis can in large part be traced to that rendered potential by photosynthesis. See ENERGY OF PLANTS.

PHOTOTAXIS (Neo-Lat., from Gk. *phōs*, *phōs*, light + *taxis*, arrangement, from *tassein*, to arrange). 1. In animals, the control by light of the direction of locomotion. Like the unicellular plants, the Protozoa, as well as higher animals, may migrate in a direction determined by that of the rays of light. According as the migration is towards or from the source of light, we can distinguish positive and negative phototaxis. The flagellate Infusoria (*Chilomonas* and *Euglena*) will move towards the light, crowding together on the illuminated side of the vessel. *Amoeba* has been observed by Davenport to be strongly phototactic, showing that such responsiveness is a general property of protoplasm, the result of chemical changes produced by light. Ciliate infusorians are not markedly phototactic. Cells containing kinds of pigment differing so widely as the chlorophyll of plants and the retinal pigment of the eyes of arthropods respond to the action of light in a similar way, this response being adaptive. A striking example of phototaxis in pigmented cells (chromatophores) is described by Keller. He has discovered that the dark color of the (illuminated) skin is owing to the rich branching at the base of the epidermis of black pigment cells lying deep in the cutis. In the dark the pigment granules stream out of the branches into the cell body, but the branches themselves are undisturbed. So long as the black pigment has this central position, the skin appears whitish. The light, on the contrary, causes the pigment, which is probably carried passively in the plasma, to move centrifugally. (See PIGMENT.) *Hydra* was observed by Trembley to wander towards the light, and this is of advantage to the animal, because many of the Entomostraca on which it feeds are also phototactic. So also is the starfish. The phenomenon is especially marked in bilateral animals, such as planarians, annelids, crustaceans, flies, and many other insects, mollusks, and vertebrates. As Davenport states, animals that live in shady places or in the dark are negatively phototactic, i.e., shun the light, while those living in the light are positively phototactic. The house fly is well known to be phototactic, but its maggot shuns the light. Butterflies, says Davenport, are attuned to a high intensity of light, moths to a low intensity, so that bright sunlight, which calls forth the one, causes the other to retreat. On the other hand, a light like that of a candle, so weak as not to stimulate a butterfly, produces a marked response in the moth. The males and females of ants have been observed while mating in the air to be strongly phototactic, but after that period

they show themselves neutral. (Loeb.) The larvæ (nauplii) of barnacles as well as other pelagic animals rise to the surface of the sea during the night, but descend before the strong sunlight. Temperature also affects phototaxis; a low temperature causes several of the normal responses, while under a high temperature it is accelerated; Loeb has found also that a concentrated medium, as when the water is rendered more salt, acts as the lower temperature. While in the retina of the eye the protoplasm is specialized for perceiving light, there is some evidence that in the eyeless animals the whole surface of the body contains such light-perceiving substances. This is well known to be the case with earthworms, and perhaps with the oyster, *Pholas*, *Umo*, etc. The pelecypod *Psammobia*, the blind *Proteus* of caves, and *Triton cristatus* when blinded are irritated by rays of light, especially the blue rays, falling on the skin. Consult Davenport, *Experimental Morphology*, part i (New York, 1897), which contains a full bibliography. Cf. TROPISM.

2. In plants, the sensitiveness to illumination. This may be fundamentally the same as heliotropism (q.v.). The effect of light upon the organism may be to accelerate or to retard the movements of the motor organs on the illuminated side, this causing the body to be rotated until both sides are equally illuminated (see CHEMOTAXIS; CHEMOTROPISM), when any progress will then necessarily be towards or away from the source of light. Organisms that approach the source of light are said to be positively phototactic, those that recede from it negatively so. The same organism may show successively both forms of response in light of different intensity. For instance, *Euglena viridis* is positively phototactic in weak light, but negatively so in strong. See EVOLUTION; HELIOTROPISM.

PHOTOTHERAPY (from Gk. *phōs*, *phōs*, light + *therapeia*, *therapeia*, cure, from *therapeuein*, *therapeuein*, to cure, from *therapōn*, *therapōn*, attendant) Treatment of disease by means of light. The method of applying light for therapeutic purposes, devised by Dr. Niels R. Finsen, of Copenhagen, about 1896, is founded on the following data: (1) the bactericidal property of the chemical rays of light; (2) the power of the chemical rays of light to produce an inflammation of the skin (sunburn, *erythema solare*); (3) the power of the chemical rays of light to penetrate the skin. The violet and ultra-violet rays of light obtained from the sun or from an electric arc lamp will, in a few hours, kill plate cultures of *Bacillus prodigiosus* at a great distance. The so-called sunburn is not a burn. If sunlight or electric light be passed through a layer of distilled water so arranged as to cut out the infrared rays (the dark rays of heat), the resulting skin inflammation is as great as if the light were uncontrolled. If sunlight be thrown on the skin through a glass screen which cuts out the violet and ultra-violet rays, no inflammation is seen. Again, if small sealed bottles containing muriate of silver be placed under the skin of some animals kept in the dark and of some animals exposed to the sun, and the tubes be removed an hour later, it will be found that the muriate of silver is blackened in the cases of the animals that were exposed to the sunlight, but not in the cases of those kept in the dark. It is shown by experiment that the chemical rays of light penetrate more easily in bloodless tissues than in

those filled with blood. In a piece of sensitized paper put against the back of a man's ear on the front of which the blue and violet rays are allowed to fall for five minutes, no reaction takes place. If the paper be replaced and the ear be compressed tightly between two glass plates and exposed again to the same light, the paper will be blackened after 20 seconds' exposure. In the treatment of patients sunlight is used in summer, when the sky is bright, but otherwise the light of electric arc lamps of 50 to 80 amperes is employed. Concentration of the light is necessary to render it powerful as a bactericide. To avoid burning the skin the light must be colored. To make the sunlight strong yet cool Finsen devised a special apparatus consisting of a lens about 20 to 40 centimeters in diameter. The lens, composed of a plain glass and a curved one, is framed in a brass ring, with a bright blue, weak ammoniacal solution of sulphate of copper between them. The water absorbs the infra-red rays and, being blue, it excludes much of the red and yellow rays. The excluded heat rays have little bactericidal power, whereas the blue, violet, and ultra-violet rays are but slightly impaired in chemical or bactericidal power. The lens is so hung that it can be raised and lowered as well as turned on a vertical and horizontal axis, by which means it can be placed perpendicularly to the sun's rays and at such a distance as to make the light strike the diseased area. For concentrating the electric arc light Finsen devised an apparatus consisting of lenses of quartz framed in two brass tubes, telescoping the one within the other. Quartz allows the ultra-violet rays (even those of short wave length) to pass through it more easily than they pass through glass, and these rays from the electric light are of less length than those from sunlight. Facing the lamp are placed two lenses having together a focal distance of 12 centimeters. At this distance from the lamp those lenses will concentrate and render parallel the divergent rays from the lamp and direct them through the brass tubes, at whose distal end they strike two quartz lenses. These lenses concentrate the parallel rays and converge them till they are united about 10 centimeters beyond the outer lens. The space between these latter lenses is filled with distilled water, which absorbs the infra-red rays, but does not impair the blue, violet, and ultra-violet rays. Surrounding this end of the apparatus is a mantle, through which cold water flows to prevent boiling of the distilled water between the lenses. In spite of all this precaution the light is still too warm, and the skin must be cooled to avoid burning. This is effected by an apparatus consisting of a plate of quartz and a plain convex lens of quartz, both fitted into a conical brass ring, which carries two small tubes and four arms. To each arm is fastened an elastic band by means of which the apparatus is pressed against the skin. Cold water is run into one tube and out of the other, and thus the skin is cooled so that it can tolerate the strongest light. The pressure of the plano-convex lens on the skin renders it anæmic, thus fitting it for the easy penetration of the chemical rays. A small area of the skin is treated for an hour each day. The skin swells and becomes red, and a bulla may appear; but sloughing has not resulted. During the application the nurses are obliged to wear dark glasses to protect their eyes from the brilliant light. Dilatation of cutaneous vessels by violet rays may continue for several weeks.

Treatments are given also by means of various lamps that produce pure ultra-violet rays and by those that employ the blue or red frequencies, as well as by those utilizing the entire spectrum. Treatments by the blue rays are given by means of the minim light, which consists of an incandescent lamp of 50 candle power inclosed in an aluminium reflector and covered by a cobalt-blue glass. This makes a portable apparatus and is very effective, but owing to its smallness considerably longer treatments are necessary to accomplish results. The ordinary marine searchlight is used in many cases. The lamp is placed at a distance of from 10 to 20 feet and the beam of light is concentrated on the part to be treated. This beam is used with or without a screen of cobalt-blue glass. The blue glass absorbs the heat frequencies and the patient is able to take longer sittings.

The entire range of the spectrum is used by the leucodescent lamp and the electric-light bath. The leucodescent lamp consists of a group of 50-candle-power incandescent lamps or one 500-candle-power lamp inclosed in a reflector, which focuses the light to a small area but not to a point. If the focus is too small the heat generated is too great to be borne. The lamp is suspended from a frame and is kept moving over the skin at a distance of about 2 feet. The treatment is continued until the surface of the skin is thoroughly reddened and a sensation of warmth is produced in the part of the body exposed. The electric-light bath, instituted by Kellogg in 1894, consists of a large wooden cabinet lined with plate-glass mirrors and containing a number of incandescent lamps, or several arc lights, or a combination of both. The patient disrobes and enters the cabinet, leaving the head extending above the top. The cabinet is then closed and various numbers and combinations of lamps are turned on. A nurse standing near by takes the temperature of the patient to avoid too high a rise in body temperature. This gives a general treatment and is used in constitutional conditions, especially those produced by absorption of toxic materials generated within the body. It is used also in the reduction of excessive accumulation of fat. The electric-light bath is given also by means of boxes containing electric lamps and made to fit around various parts of the body.

The greatest benefit from phototherapy, employing the higher frequencies, has been found in cases of eczema, acne vulgaris, alopecia areata, epithelioma, nevus vasculosus, lupus, tuberculous glands, and local septic processes. The red rays have been used in the treatment of smallpox. The treatment devised by Finsen is to exclude all rays above the red by means of red cloth or very thick glass. Not the slightest ray above the frequency of the red must strike the patient from the first appearance of the eruption until every vesicle is dry. The treatment has resulted in the recovery of patients without scarring. The objection to this treatment is that continual exposure to the red frequencies produces over-excitation, which makes treatments severe on both patient and attendants. Phototherapy is now employed by well-known physicians and sanitariums in the United States and in Europe.

Bibliography. N. R. Finsen, *Phototherapy*, translated by J. H. Sequeira (London, 1901); C. W. Allen, *Radioradiation and Phototherapy* (Philadelphia, 1904); W. J. Hammer, *Radium and Other Radio-Active Substances* (2d ed.,

New York, 1904); M. A. Cleaves, *Light Energy* (ib., 1904); M. K. Kassabian, *Röntgen Rays and Electro-Therapeutics* (2d ed., Philadelphia, 1910); C. E. Rogers, *Textbook on the Therapeutic Action of Light* (Chicago, 1910); C. S. Potts, *Electricity: Its Medical and Surgical Applications* (Philadelphia, 1911); N. S. Finzi, *Radium Therapeutics* (Oxford, 1914); W. S. Newcomet, *Radium and Radiotherapy* (Philadelphia, 1914). See FINSSEN, NEELS RYBERG; HELIOTHERAPY.

PHOTOTROPISM (from Gk. *phōs*, *phōs*, light + *τροπή*, *trōpē*, a turning, from *τρέπω*, *trepein*, to turn). A sensitiveness of plant organs to light, by virtue of which they bend to assume definite positions with reference to the direction of light incident upon them. See HELIOTROPISM; TROPISM.

PHRANTZA, frānt'zā, or **PHRANTZES**, frānt'zās (Gk. *Φραντζή*, *Phrantzē*), GEORGE (1401-c.78). A Byzantine historian, born at Constantinople. He was secretary to the Emperor, Manuel II, and held other high offices, finally that of chancellor. At the fall of Constantinople (1453) he was captured, but managed to escape to the court of Thomas Palæologus. When Achæa also was captured by the Turks (1460) Phrantza retired to the monastery of Tarchaniotes in Corfu, where he wrote his valuable *Chronicle*, embracing the period of Byzantine history from 1259 to 1477, edited by Bekker (Bonn, 1838), and also in Migne's *Patrologia Græca*. Consult Carl Krumbacher, *Geschichte der byzantinischen Litteratur* (2d ed., Munich, 1897).

PHRASE (Lat. *phrasis*, from Gk. *φράσις*, manner of speech, from *φράσσειν*, *phrassein*, to declare). The name given, in music, to the simple motives containing in themselves no satisfactory musical idea, which enter into the composition of every melody containing a perfect musical idea. (See FORM.) The word "interpretation" denotes, in music, a number of notes corresponding to a sentence in speech. See PHRASING; TYPICAL PHRASE.

PHRASING. The proper rendering of musical phrases. (See PHRASE.) A musical composition is analogous to a literary one, the sentences being replaced by phrases; on their correct interpretation depends the intelligible presentation of the whole piece. One of the most important elements of phrasing is accent (q.v.), the general principles of which will be found under RHYTHM; but in no case must an accent be so insisted on as to break the unity of the musical phrase. On the contrary, the ordinary accent is often postponed or anticipated in order to emphasize the general effect of the phrase. For the same reason, especially in rapid passages, accents are often added; while in quick movements accents are sometimes omitted so as to give an impression of unity to a number of separate bars. Breaking up a group of notes which together form a musical sentence and running together two distinct sentences are two common faults in phrasing. In instrumental work, especially, there is a tendency to make a break at the end of a bar; but in reality a sentence always ends on the accented division of a bar, the bar stroke having absolutely no relation to phrasing. In vocal music the musical accents correspond with those of the text, and the phrases are, as a rule, dependent on the lines or word sentences. Vocal phrasing, therefore, is obviously much simpler than instrumental. The signs most commonly used to in-

dicate phrasing are the dash, the curved line, denoting *legato*, and the slur; but the interpretation of any composition is to a great extent a matter of personal appreciation and discrimination. Consult M. Lussy, *Traité de l'expression musicale* (7th ed., Paris, 1897); C. A. Ehrenfechter, *Delivery in the Art of Pianoforte Playing* (London, 1897); A. J. Goodrich, *Theory of Interpretation* (Philadelphia, 1899); T. Matthay, *Musical Interpretation* (Boston, 1913).

PHRATRY (Gk. *φρατρία*, *phratría*, from *φάτρης*, *phátēs*, a word akin to Lat. *frater*, brother, Ger. *Bruder*, brother, Eng. *brother*). At Athens, a subdivision of the phylæ (q.v.), whose members, at least originally, were all connected by ties of blood. For admission to the phratry, see GREEK FESTIVALS, *Apaturia*.

PHRENOLOGY (from Gk. *φρήν*, *phrēn*, heart, mind + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The theory that the mind consists of localized independent faculties, each one in a region of the brain whose size indicates the degree of the faculty resident in it. Franz Joseph Gall (q.v.), an eccentric Viennese physician, announced about 1796 the discovery of a system of phrenology. He asserted that he had reached it empirically by examining the heads of individuals who exhibited unusual mental or moral endowments. He thus worked out correlations between the topography of the skull and traits of character. He further concluded that the size and configuration of the brain are represented by those of the skull. His lectures, begun in 1796, ceased at the order of the Austrian government in 1802, his doctrines being judged to be inimical to morality and religion. In 1804 he associated with him his pupil, Johann Kaspar Spurzheim (q.v.), and the two traveled through Germany and Switzerland to France. In Paris the French Institute appointed a commission to investigate their assertions. The commission reported favorably on methods of dissection, etc., but declared their main conclusions hypothetical. In 1809 the two began the publication of a work entitled *The Anatomy and Physiology of the Nervous System in General, and of the Brain in Particular, with Observations upon the Possibility of Ascertaining Several Intellectual and Moral Dispositions of Man and Animals by the Configuration of their Heads*. Gall died in Paris in 1828, respected and honored. Spurzheim went to America in 1832, but died shortly after his arrival at Boston.

The fundamental tenets of phrenology are that the brain is the material substrate of mind; that it is a multiplex structure, composed of a definite number (originally 34, now 42) of constituent organs, each one the seat of a particular power of the mind—a "sentiment," a "propensity," or an "intellectual faculty." Furthermore, these 42 organs constitute a series of cones with their apices at the oblongata and their bases at the surface. Every prominence in the skull indicates the size of the organ beneath it, and thus the development of the correlated mental faculty. The propensities or passions, situated at the lower and posterior part of the brain, are Amativeness, philoprogenitiveness, continuity, adhesiveness or friendship, combativeness, destructiveness, etc. The sentiments, situated at the superior portion of the cranium, are self-esteem, love of approbation, cautiousness, firmness, benevolence, etc. The intellectual faculties in the anterior region are individuality, form, space or size, weight or resistance, color, locality, etc.

In diagnosis the size of the prominence determines the degree of the faculty only when taken in conjunction with other tendencies, for one faculty may aid or inhibit the function of another.

From the standpoint of science phrenology is related to modern neurology as astrology to astronomy or alchemy to chemistry. It served a useful purpose in stimulating the investigation of cortical function, in enforcing the dependence of mind upon brain, and in offsetting the views of men like Magendie and Flourens, that the brain functions homogeneously throughout. But in the light of modern knowledge phrenology is bad psychology and bad neurology. Modern psychology does not regard the mind as a bundle of faculties. Neurologically, too, there are many disproofs of phrenology. Different skulls have a different thickness, prominences do not necessarily show the size of the brain beneath, three-fifths of the gray matter of the cortex is concealed in the sulci; accident or disease destroys or impairs sensory or motor functions connected with some sense department or some association system, not some faculty. Finally, the whole structure of phrenology falls with the investigations of cortical localization by the methods of degeneration, electrical stimulation, medullation, and extirpation. See **PHYSIOLOGY**.

Bibliography. Sewall, *An Examination of Phrenology* (Washington, 1837); *Phrenological Journal*, vol. xxxi (New York, 1885); H. H. Donaldson, *The Growth of the Brain* (ib., 1898); L. F. Barker, *Nervous System and its Constituent Neurones* (ib., 1899); Bernhard Hollander, *Revival of Phrenology* (ib., 1901); id., *Scientific Phrenology* (London, 1902); J. C. Spurzheim, *Phrenology* (Philadelphia, 1911).

PHRIXUS, φρίξ'σ'ς (Lat., from Gk φρίξος). In Greek legend, the son of Athamas and Nephele. With his sister Helle he was rescued by his mother when about to be sacrificed to Zeus, and carried to Colchis on a ram with golden fleece. On the journey Helle fell into the water and was drowned. This part of the sea was called after her the Hellespont. The fleece of the ram, given to King Autes and hung in the grove of Ares, was the object of the Argonautic Expedition. See **ARGONAUTS**.

PHRYGIA, φριγ'ία (Lat., from Gk φρυγία). A country in Asia Minor, the extent and boundaries of which varied very much at different periods of ancient history (Map: Greece, Ancient, G 2). Originally the east boundaries were the river Halys and the territory about Iconium, the last Phrygian city; towards the south, Phrygia touched the Taurus and the Pisidian Mountains; on the north it reached the Hellespont and the Propontis; on the west it seems to have included the Troas and Mysia, and may have held suzerainty over Lydia and Caria. Later invaders from Thrace, who occupied Bithynia and Mysia, cut this region into two parts—Little Phrygia, a somewhat indefinite region south of the Hellespont, and Greater Phrygia, which alone preserved the national character. This was bounded on the north by Bithynia and Paphlagonia, on the east by Pisidia, Lycania, on the south by Cappadocia, and on the west by the maritime countries of Mysia, Lydia, and Caria. The boundaries were further modified by the Gallic invasion of the third century B.C. (See **GALATIA**.) Pergamene conquests added part of southern Bithynia, including the important city of Dorylaeum, under the name of Phrygia Epictetus. For

purposes of provincial administration the Romans divided Phrygia, attaching the northeastern part to the Province of Galatia and the western portion to the Province of Asia. Phrygia was in general a high and somewhat barren plateau, though its pastures supported enormous flocks of sheep noted for the fineness of their wool, as indeed they still are. The most fertile part was the valley of the Sangarius, but the most beautiful and populous district was the southwestern, at the base of the Taurus, where the Mæander and other streams had their rise, and here were the chief cities, Synnada, Celenæ, Apamæa, Colossæ, Laodicea, while farther to the east lay Antioch. The mountains and streams yielded gold. Phrygian marble was anciently celebrated, and the cultivation of the vine appears to have been extensively carried on.

The Phrygians were certainly an Indo-European race, and appear to have entered Asia Minor from Thrace, pushing into the interior from the Troad along the valley of the Sangarius, making themselves masters of the whole tableland and probably extending their sway over the Asiatic tribes on the coast. We hear of a race of powerful kings alternately bearing the name of Gordius and Midas, and in the mountains near the headwaters of the Sangarius are the great rock-cut tombs or façades which were associated with these rulers. The invasions of the Cimmerians (c.675 B.C.) appear to have broken their power, and thenceforth they played no part in history, but fell first under the rule of the growing Lydian kingdom, then successively under that of Persia, Macedon, Pergamum, and Rome. They appear to have been a peaceful rustic people, devoted to agriculture and cattle raising. Their religion was an ecstatic nature worship in which the Great Mother of the Gods, Rhea or Cybele, and a male deity, Sabazius, played a great part. The orgiastic rites and wild music seem to have exercised considerable influence on the Greeks and the Romans, and we find the Phrygian deities transplanted to the Western world.

Bibliography. Sir W. M. Ramsay, *Historical Geography of Asia Minor* (London, 1890); id., *Cities and Bishopsrics of Phrygia* (Oxford, 1895-97); id., *Studies in the History and Art of the Eastern Provinces* (New York, 1906); id., *Pauline and Other Studies* (ib., 1906); id., *Cities of St. Paul* (ib., 1907); T. Eisele, "Die phrygischen Kulte," in *Neue Jahrbücher für das klassische Altertum*, vol. xxiii (Leipzig, 1909); the article "Phrygien," in Friedrich Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., ib., 1914).

PHRYGIAN (frij'j-an) **CAP.** See **LIBERTY CAP**.

PHRYGIAN LANGUAGE. The native language of the Phrygians is known partly through glosses preserved by Hesychius and other lexicographers and authors, partly through inscriptions found in the territory once occupied by this people. Tombs with inscriptions were discovered in the valley of Doghanla by Colonel Leake in 1820. Four of these inscriptions, including that on the sepulchre of King Midas, were first published by Hamilton in 1842. A number of additional inscriptions were published by Ramsay in 1883; others copied by himself and Sterrett appeared in 1884. A complete collection of the Phrygian inscriptions of the Roman period, so far as known at the time, was published by Ramsay in 1905, and a corpus of all Neo-Phrygian inscriptions, over 60 in number, was produced

by Calder in 1911. Many of these are in Greek, but have Phrygian additions at the end. That the additions contain formulas of execration was first surmised by Schmidt in 1869. The researches of Ramsay and Fick have corroborated this conjecture. As Herodotus (vii, 73) and Strabo (xlvii, ccxcv) declare that the Phrygians were related to the Armenians and the Thracians, it was natural that the language should be supposed to be Armenian. That was done by Mordtmann and Gosche. A collection of 63 glosses was made by Lagarde. He concluded that the Phrygians were derived from the Thracians and that their Iranian character was proved by such words as *ἀδάμνα* and *κύρβαττ*. Since Hübschmann's investigations have shown that the Armenian is not an Iranian language, but belongs to an independent branch of the Indo-Germanic family, including the Thracian, the Phrygian, and possibly the Lydian and Mysian as well as the Armenian, Ramsay, Beloch, Meyer, and others no longer think of an Iranian derivation. This is in harmony with the now generally accepted view that the Phrygians invaded Asia Minor from Thrace about the twelfth century B.C. While most of the monuments found belong to the Roman period, there are some that have plausibly been assigned by Ramsay to the end of the eighth century B.C. If one doubtful letter is an *χ* rather than a *ψ*, as seems probable, the Phrygians apparently received their alphabet, not from the Ionians, but from the old *Æolians*. After the Phrygian language had been supplanted by the Greek it still maintained itself in imprecations, believed to be more efficacious in the speech of the fathers. The same alphabet has been found at Abu-Simbel in Egypt in inscriptions that must date from the time of Psammetichus II (594-588 B.C.) and in an inscription found in Lemnos in 1886 in an unknown language and of uncertain age.

Bibliography. W. M. Leake, *Journal of a Tour in Asia Minor* (London, 1824); W. J. Hamilton, *Researches in Asia Minor, Pontus, and Armenia* (ib., 1842); Stewart, *Ancient Monuments of Lydia and Phrygia* (ib., 1842); Paul de Lagarde, *Gesammelte Abhandlungen* (Leipzig, 1866); Moritz Schmidt, *Neue lykische Studien* (Jena, 1869); Sir W. M. Ramsay, in *Journal of the Royal Asiatic Society*, vol. xv (London, 1883); id., in *Journal of Hellenic Studies* (ib., 1882, 1884); id., in *Zeitschrift für vergleichende Sprachforschung*, vol. xxviii (Gütersloh, 1887); Kretschmer, *Einleitung in die Geschichte der griechischen Sprache* (Göttingen, 1896); Hübschmann, *Die altarmenischen Ortsnamen* (Leipzig, 1904); August Fick, *Vorgriechische Ortsnamen* (Berlin, 1905); Sir W. M. Ramsay, in *Jahreshefte des österreichischen archäologischen Instituts*, vol. viii (Vienna, 1905); W. M. Calder, "Corpus Inscriptionum Neo-Phrygianum," in *Journal of Hellenic Studies*, vol. xxxi (London, 1911); K. J. Beloch, *Griechische Geschichte* (2d ed., Strassburg, 1912-13); Eduard Meyer, *Geschichte des Altertums*, i, 2 (3d ed., Stuttgart and Berlin, 1913).

PHYRYNE (Lat., from Gk. *Φύρις*). One of the most celebrated courtesans of antiquity. She was a daughter of Epicles and was born at Thebes in Boeotia. She was of very humble origin, and is said originally to have gained her livelihood by gathering capers, but her beauty afterward brought her such wealth that, when Alexander destroyed the walls of Thebes, she is said to have offered to rebuild them if she

might be allowed to inscribe on them the words: "Alexander destroyed them, but Phryne, the courtesan, rebuilt them." Being on one occasion accused by Euthias of profanation of the Eleusinian mysteries, she was summoned before the court of the Heliasts and was there defended by the orator Hyperides. When Hyperides saw that the verdict of the court was likely to be unfavorable he threw aside her veil and exposed her bosom and shoulders. The judges thereupon acquitted her, and she was carried in triumph to the temple of Aphrodite. She served as the model for Praxiteles' "Cnidian Venus" and for the "Venus Anadyomene" (q.v.) of Apelles (it was said that she suggested the latter picture to Apelles when, on the occasion of a festival of Eleusis, she entered the sea, unclad, in the presence of the assembled throng). Her neighbors dedicated to her at Delphi a gilded statue resting on a base of Pentelic marble, the whole the work of Praxiteles. There is preserved in Athenæus an epigram in her praise, written by Praxiteles and inscribed on a statue of Cupid, which Praxiteles presented to her and which she dedicated at Thebes.

PHYRYNICHUS, *φρίνικος* (Lat., from Gk. *Φρύνιχος*). 1. A Greek tragic poet of Athens, an older contemporary of *Æschylus*. He won his first victory in 511 B.C. and his last in 476, when Themistocles was his *choragos*. Like *Æschylus*, he is said to have died in Sicily. In all the accounts of the rise and development of Greek tragedy, Phrynichus is ranked immediately after Thepsis (q.v.), and according to some critics he should be regarded as the real inventor of tragedy. He was the first to bring female characters on the stage; for the light satyr plays of his predecessors he substituted plays on serious subjects taken both from the heroic age and from the history of his own time; and he was the first to introduce an actor distinct from the leader of the chorus and thus to open the way for the development of dialogue. In his works, however, the lyrical choruses still retained the principal place, and these are said to have been so celebrated that they were sung even in the time of Aristophanes. Of his plays the most important were *Φούρλοισι*, *Phænissæ*, which dealt with the defeat of the Persian invaders (480 B.C.) and is said to have been copied by *Æschylus* in *The Persians*, and *Μιλήτου ἄλωσις*, *Miletou Halôsis*, on the capture of Miletus by the Persians. According to Herodotus the Athenians were so moved by the latter tragedy that they fined the poet 1000 drachmas for recalling to them the disasters of their kinsmen, and passed a law forbidding further performances of the piece. Only a few fragments and the titles of nine of his plays are extant. Consult: Nauck, *Tragicorum Græcorum Fragmenta* (Leipzig, 1856); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i (6th ed., Munich, 1912).

2. A poet of the Old Attic Comedy, contemporary with Aristophanes (q.v.). He wrote at least 10 plays between 429 and 405 B.C. For the fragments, see Theodor Kock (ed.), *Comicorum Atticorum Fragmenta*, vol. i (Leipzig, 1880).

3. A Greek grammarian and lexicographer, a native of Bithynia, who lived in the second century A.D. His writings include a work on Attic words, in two books, and *Σοφιστικὴ Παράσκευη* (*Sophistical Equipment*), a lengthy work. For

a fragment of this work, see I. Bekker, *Aneodota Græca* (1814). We still have Phrynichus' *Selection of Attic Words and Phrases*, a collection of current words and forms of words which differ from the true old Attic standard; the Attic equivalent in each case is given. This work was edited by C. A. Lobeck (1820) and by W. G. Rutherford, in *The New Phrynichus* (1881). Consult also: G. Kaibel, *De Phrynicho Sophista* (Göttingen, 1899); J. E. Sandys, *A History of Classical Scholarship* (2d ed., Cambridge, 1906); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

PETHIOTIS, pthi-ō'tis (Lat., from Gk. Φθιώτις). In ancient geography, the southern part of Thessaly, north of Ænis and Malis and west of the Pagasæan Gulf. The district was famous in the epic as the home of Achilles, and from this region the Æolian colonization of Asia Minor is thought by some scholars to have gone forth. The population, though maintaining a Thessalian element, was considered to be Achæan. The chief cities were Phthiotian Thebes, Larissa, Lamia, Melitæa, and Thaumaci.

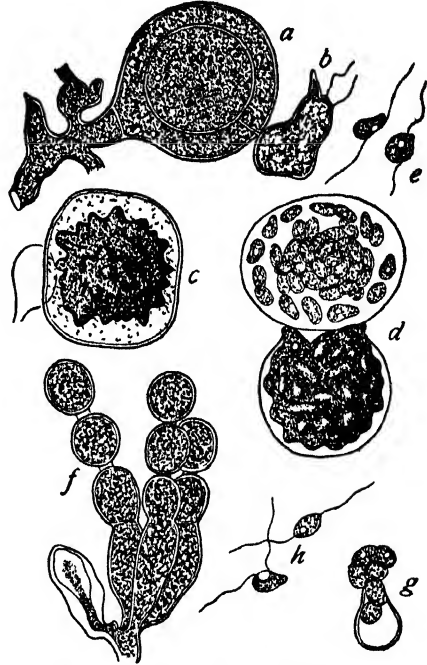
PETHISIS, pthi'sis. See TUBERCULOSIS.

PHYCOCYANIN (from Gk. φῦκος, *phykos*, seaweed + κυανός, *kyanos*, blue) The blue pigment peculiar to the blue-green algæ, in which it is associated with a green pigment, resulting in a characteristic bluish-green tint. See CYANOPHYCEÆ.

PHYCOERYTHRIN, fi'kō-ēr'i-thrin (from Gk. φῦκος, *phykos*, seaweed + ἐρυθρός, *erythros*, red) The red pigment of the red algæ contained in the chromoplasts, giving the general tint of the plant body, and of course associated with the green pigment chlorophyll. See RHODOPHYCEÆ.

PHYCOMYCETES, fi'kō-mī-sē'tēz (Neo-Lat. nom. pl., from Gk. φῦκος, *phykos*, seaweed + μύκης, *mykēs*, fungus). A group of plants which comprises, as the name indicates, those fungi most resembling the algæ (See FUNGI). The Phycomycetes include the black molds (Mucorales), certain insect parasites (Entomophthorales), the water molds (Saprolegniales), and a group of very important plant parasites included in the order Peronosporales. The simplest of the Phycomycetes are unicellular aquatic forms (Chytridiales) that usually live parasitically in the cells of algæ. These representatives are most often observed in a quiescent condition, in the form of thick-walled spores or resting spore cases, but there are motile periods in the life history when the organisms swim freely in the water. The Entomophthorales are mostly parasitic on insects, preferring the Diptera and Orthoptera, a common representative (*Empusa*) being found on the house fly. Late in the summer and in the autumn dead house flies may frequently be observed attached by their probosces to window panes, walls, and other surfaces, with a halo of yellowish powder on the surface around them. This powder is made up of spores that have been thrown off from the ends of fungal filaments, which after filling the body of the insect have grown through the segments to the exterior. The large common molds (Mucorales) are frequently called black molds because of the color of the spore cases (sporangia) and to distinguish them from the green and yellow mildews. They are saprophytes, growing upon organic matter in damp places, the bread mold (*Mucor*) being a

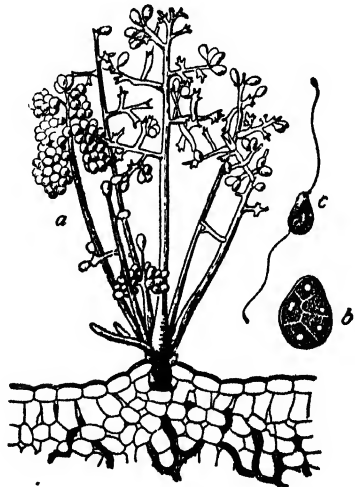
familiar example. The vegetative portion of the molds (mycelium) consists of conspicuous threads (hyphæ) plainly visible to the eye,



WHITE MILDREW (*Albugo candida*)

a, oogonium, b, antheridium, c, oospore, d, swarm spores escaping from oospore, e, swarm spores, f, conidia; g, swarm spores escaping from conidium, h, the same, more distinct.

which grow over the substratum and when possible penetrate it in all directions. The commonest fructification is a black swollen head

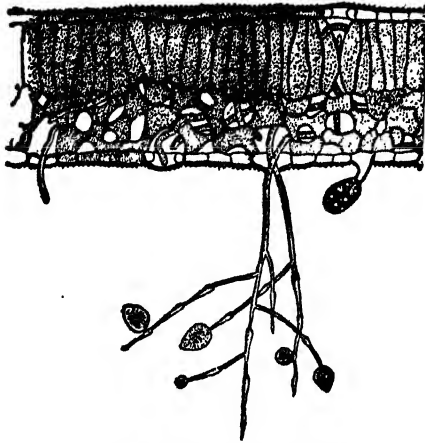


GRAPE MILDREW (*Plasmopara*)

a, the branching sporophores arising from the surface of the host; b, a germinating spore; c, a swarm spore.

(sporangium) containing thousands of spores and borne at the end of an erect branch (sporangiophore). The Peronosporales are an assem-

blage of forms, mostly parasitic, and contain some fungi responsible for such serious diseases as the rot of potato and the downy mildews of grapes. (See *Diseases* under GRAPE and POTATO.) Another troublesome form, sometimes



DOWNY MILDEW OF POTATOES (*Phytophthora infestans*).
Cross section of leaf showing growth of mildew.

placed among the Peronosporales and sometimes among the Saprolegniales, is *Pythium*, the fungus responsible for the damping off (q.v.) of seedlings. The water molds (Saprolegniales) have habits widely different from other Phycomycetes, being aquatic and living on dead insects, fish, and frogs, and sometimes on the living animals. They surround the body with a beautiful halo of delicate radiating filaments. These fungi sometimes cause epidemics in fish hatcheries, where they attack the mouths and gills of young trout and salmon. Consult: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887 et seq.); B. M. Duggar, *Fungous Diseases of Plants* (Boston, 1909); G. E. Massee, *Diseases of Cultivated Plants and Trees* (New York, 1910); F. L. Stevens, *The Fungi which Cause Plant Disease* (ib., 1913).

PHYCOPHÆIN (from Gk. *phûkos*, *phykos*, seaweed + *phaios*, *phaios*, dusky). A brown pigment characteristically present in the cells of the brown algae, in which it is associated with other pigments, such as phycocyanin and chlorophyll. See **PHÆOPHYCÆE**.

PHYLACTERY (Lat. *phylacterium*, from Gk. *φυλακτήριον*, *phylaktērion*, safeguard, amulet, from *φυλακτήρ*, *phylaktēr*, sentinel, guard, from *φυλάσσειν*, *phylassein*, to guard). An amulet (q.v.) or charm worn as a protection against evil influences. In the New Testament the name is given to a strip of fine parchment inscribed with certain passages from the Scriptures (Ex. xiii. 1-10, xiii. 11-16; Deut. vi. 4-9, xi. 18-21) and inclosed in a small leathern case. This was, in accordance with a literal interpretation of Ex. xiii. 9-16; Deut. vi. 8, 9, 18, fastened by leathern straps to the forehead, just above and between the eyes, or to the left arm, at the point where the arm, hanging down, falls nearest the heart; sometimes it was fastened to the doorpost.

PHYLÆ (Lat. nom. pl., from Gk. *φυλή*, *phylê*, tribe). In Greek political institutions, the tribes or clans, originally perhaps embracing all the inhabitants of a district, though in

many cases membership in the phylæ seems to have rested on a theory of common descent rather than on residence in a given district. Among the Dorians we regularly find the three tribes, Hylleis, Dymanes, and Pamphyli; at Miletus in Ionia and at Athens we find Geleontes, Argadeis, Ægicoreis, and Hopletes, and these names recur in other Ionian communities. The most important development of the tribe was in the reorganization of the Athenian democracy by Clisthenes (q.v.) after the expulsion of the tyrant Hippias (510 B.C.). The four old tribes were swept away and the whole people divided into 10 tribes, on the basis of the demes (see **DEME**) in which the people were registered. The demes in each tribe were so selected that the three divisions of Attica, mountain, coast, and plain, were all represented. The tribes, which were named from heroes, were Erechtheis, Ægeis, Pandionis, Leontis, Acamantis, Ceneis, Cecropis, Hippothontis, Eantis, Antiochis. The tribes were organized as corporations, and held regular meetings, apparently at Athens, but not in their own halls. The executive officers were the Epimeletæ and a treasurer who had charge of the property of the tribes, for, as each eponymous hero had priest and sanctuary and received a certain part of all booty in war, the tribe had to manage certain lands and investments. The tribe chose its representatives on state commissions, where work was divided among the tribes, such as the repair of walls, etc. They also elected the rich men, whose duty it was to provide the choruses for intertribal competition at the festivals or other similar public duties laid upon the rich. The military organization was based on the tribal division, for each tribe furnished a regiment of infantry under a taxiarh and a squadron of cavalry under a phylarch. Though the Senate was composed of 50 from each tribe, the Senators were not chosen by the tribe but by the demes, among whom they were apportioned on the basis of population. Consult the article "Tribus" in W. Smith, *A Dictionary of Greek and Roman Antiquities*, vol. ii (3d ed., London, 1891). See **ECCLESIA**.

PHYLAKOPI, *fé-lá'kô-pé*. The name of a modern site on the northeast coast of the island of Melos (q.v.), excavated in 1896 by the British School of Classical Studies at Athens. Important remains of a pre-Mycenæan civilization were found, including houses, a palace, a town wall, and pottery. Consult H. M. Fowler and others, *A Handbook of Greek Archaeology* (New York, 1909), and H. R. Hall, *Ægean Archaeology* (London, 1915).

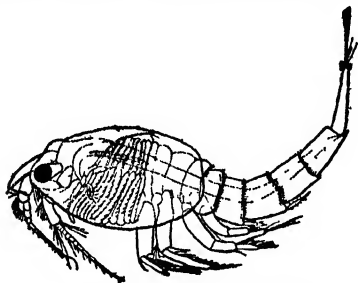
PHYLARCHUS, *ft-lär'kûs* (Lat., from Gk. *Φύλαρχος*) (c.210 B.C.-?). A Greek historian. He was born probably at Naucratis in Egypt, but spent most of his life at Athens. His great work was a history of Greece, embracing the 52 years between the invasion of the Peloponnesus by Pyrrhus (272 B.C.) and the death of Cleomenes III, King of Sparta (221 B.C.). His style was graphic and animated, but, according to Polybius (ii, 56), he frequently falsified history on account of his passionate admiration for Cleomenes. The work was used by Trogius Pompeius and by Plutarch in his lives of Cleomenes and Aratus. The few extant fragments have been edited in Müller's *Fragmenta Historicorum Græcorum*, vol. i (1841). Consult F. Susemihl, *Geschichte der griechischen Literatur in der Alexandrinerzeit*, vol. i (Leip-

zig, 1891), and Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (5th ed., Munich, 1911).

PHYLAXINS. See IMMUNITY.

PHYL/LIS (Lat., from Gk. Φυλλίς). 1. A Thracian princess, betrothed to Demophoön, the son of Theseus, who left her to go to Athens, promising to return at a certain date. When the appointed time had passed without his arrival, Phyllis killed herself and was changed into an almond tree, which put forth leaves only when Demophoön shortly afterward returned and embraced it. 2. In pastoral poetry, a name conventionally used of a maiden or a ladylove.

PHYLLOCAR/IDA (Neo-Lat., from Gk. φύλλον, *phyllon*, leaf + *kaps, karis*, shrimp). A highly composite or generalized order of Crustacea, separated by Packard from the Phyllopoda. The group is represented at the present time by *Nebalia* and its allies (*Nebaliidae*) of the North Atlantic, forming the Leptostraca of Claus; also by fossil forms from the Cambrian period to the end of the Carboniferous, some of which were more than a foot in length, while *Nebalia* itself is about half an inch long. In *Nebalia* the body is compressed and protected in



A PHYLLOCARID (*Nebalia bipes*).

front by a bivalved carapace, closed by a weak adductor muscle, but without a hinge, the rostrum is free, movable; the eyes are stalked, the eight pairs of thoracic legs resemble those of phyllopod crustacea, and the hind body is modeled on that of a copepod crustacean such as *Cyclops*. It undergoes no metamorphosis and is an example of the persistence of type from very early geological times

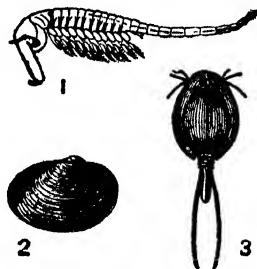
PHYLLOCLAD (from Gk. φύλλον, *phyllon*, leaf + κλάδος, *klados*, branch), or CLADOPHYLL. A branch that functions as a leaf, which it resembles in form and color. Well-known illustrations are leaves of smilax and asparagus.

PHYLLODES (from Gk. φυλλάδιος, *phyllōdēs*, leaflike). Leaves represented only by their petioles, the blades not having developed. Often such petioles develop as bladelike organs that replace regular blades. In the case of dicotyledons phyllodes may be distinguished from true leaves by the parallel veining and also by presenting their edges up and down (profile position). The greatest display of phyllodes is found among the acacias of Australia, where nine-tenths of the numerous species have phyllodes instead of true leaves. The normal blade of these acacias is pinnately compound, as is shown by their seedlings, and occasionally when older growths are subjected to unusual conditions. The first leaves of many plants are phyllodes, as in *Cicuta bulbifera*; and the submerged leaves of water plants are often phyllodes,

as in *Sagittaria heterophylla*. In the case of pitcher plants (see CARNIVOROUS PLANTS) the urns, tubes, etc., are usually regarded as hollow phyllodes, the true blade being represented by the somewhat conspicuous lids.

PHYLLOGRAP/TUS (Neo-Lat., from Gk. φύλλον, *phyllon*, leaf + γραφτός, *graptos*, written, from γράφειν, *graphein*, to write). A genus of fossil graptolites, index fossils of the Lower Ordovician rocks of North America and northern Europe. The thecae, or cells in which the animals lived, are arranged in four rows with their dorsal sides united along a common axis to form a four-bladed colony, the blades of which are at right angles to one another. See GRAPTOLITE.

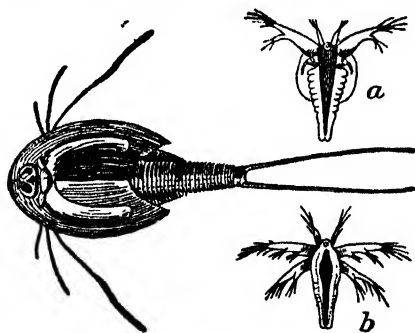
PHYLLOP/ODA (Neo-Lat. nom. pl., from Gk. φύλλον, *phyllon*, leaf + ποῦς, *pous*, foot). An order of fresh-water Crustacea, in which the legs are broad and leaflike, subdivided into lobes,



PHYLLOPOD CRUSTACEANS.

1, *Branchinecta coloradensis*, 2, shell of *Estheria belfragei*, 3, *Lepidurus couesi*.

and adapted for respiration as well as locomotion. The trunk is not differentiated into a thorax and abdomen. The eyes are usually simple or compound, and either sessile (*Apus*) or stalked (*Branchipus*), while there is a median simple eye retained from the nauplius stage. The number of body segments varies greatly, and the body is usually protected by an ample shell consisting of two valves closed by an adductor muscle. In the group represented by *Branchipus* and the brine shrimp (*Artemia*) there is no shell. These crustaceans are very primitive and apparently are the ancestral forms of the class Crus-



PHYLLOPODA AND LARVÆ.

Adult of *Apus aequalis*; and (a) larva of *Apus cancriformis*, (b) nauplius of *Artemia salina*.

tacea (q.v.), their limbs being much like the parapodia of annelid worms. A Cambrian form (*Protocaris*) is supposed to be allied to *Apus*. All the members of this order hatch in the nauplius stage and after a series of molts attain

the adult form. The phyllophods live in pools liable to dry up in summer. Their eggs are of two kinds, summer and winter, the latter being protected by a dense shell, so that they can dry up and live for months or years, the young hatching when the eggs are moistened by the refilling of the pools or ditches. In some species the males have not yet been found. Consult A. S. Packard, *A Monograph of North American Phyllopod Crustacea* (Washington, 1883). See BRINE SHRIMP.

PHYLLOTAXY (from Gk. φύλλον, *phyllon*, leaf + τάξις, *taxis*, arrangement). Leaf arrangement, i.e., the methods in which leaves are disposed upon their axes. See LEAF.

PHYLOXERA (Neo-Lat. nom. pl., from Gk. φύλλον, *phyllon*, leaf + ξηρός, *axeros*, dry). An insect of American origin (*Phylloxera vastatrix*), which belongs to the aphid family, and which, accidentally introduced into France about 1859 upon native American vines, spread through the principal vine districts of southern Europe, causing enormous damage. It has further spread into Algeria and through southern Russia into the adjoining countries of Asia. It has been carried into New Zealand and South Africa, also, as well as some parts of Australia. It was at first known in the United States only in the region east of the Rocky Mountains, but was afterward found in California, where it is confined to those vineyards in which the European vine is grown from its own roots.

The Phylloxera is indigenous to North America, where it has always existed on the wild vines. It occurs in four forms—the leaf-gall form (*gallicola*), the root form (*radicicola*), the winged or colonizing form, and the sexual form. The sexual insect lays the winter egg on the old wood. The young one hatching in the spring proceeds to a young leaf and deposits itself upon the upper surfaces, gradually forming a gall about itself which projects from the lower side of the leaf. It reaches full growth in 15 days and fills its gall with small yellow eggs numbering from 500 to 600. These eggs hatch in eight days, and the young migrate to all parts of the vine to form new galls. Six or seven generations of these wingless females follow one another through the summer, frequently covering the leaves with galls. At the approach of cold weather the young proceed to the roots, remaining dormant until spring. In the spring the root is attacked by a series of generations of wingless females, which produce swellings on the rootlets. During the late summer and autumn some of the root lice give birth to winged females, which escape through the soil and fly to neighboring vines, laying their eggs on the bark. From these eggs the sexual generation issues and the life cycle is begun again. The root form, however, may proceed in successive broods for a number of years, as is the case with the European vines, on which the leaf form rarely occurs. The insect is spread by the flight of the winged females, by the migration of the root lice through cracks in the soil, and by the carrying of the leaf-gall lice by winds, by birds, and by other insects, and further by the shipping of infested rooted plants or cuttings bearing the winter eggs. The leaf form is especially noticeable on American vines and is common on the wild vines. The root form is rarely seen, but it is the cause of the only severe injury to the plant. When the insect occurs plentifully the death of the vine in a few years is certain. The

root lice first produce enlargements on the rootlets, extending their work to the larger roots. These become swollen and broken and finally die and rot. The vine stops growing, the leaves become sickly and yellowish, and since the Phylloxera disappears from the dead roots, the cause of the death of the plant is frequently obscure. The European vine (*Vitis vinifera*) is particularly subject to attacks of the root form, while most American vines, although frequently carrying the leaf galls, are more or less immune to root attacks.

The remedies used for this pest are the subterranean injection of bisulphide of carbon and the submersion of the roots by inundating vineyards by water at certain seasons of the year. The standard preventive now employed all over the world is the use of American vines as stocks on which to graft the susceptible European varieties. The immunity of the American vines seems to be owing to the thicker bark covering of the roots and to a greater natural vigor. The chief resistant varieties of American vines are the *Æstivalis*, the *Riparia*, and the *Labrusca*. Some American vines, however, as the Delaware, are almost as susceptible as the European vines. The varieties of the *Æstivalis* most used are the *Herbemont* and *Cunningham*; of the *Riparia*, the *Clinton*, *Taylor*, and *Solonis*. Consult C. L. Marlatt, "Principal Insect Enemies of the Grape," in *United States Department of Agriculture, Farmers' Bulletin*, No. 70 (Washington, 1898).

PHYLOGENY (from Gk. φύλον, *phylon*, tribe + -γένεια, *-geneia*, production, from γίγνεσθαι, *gignesthai*, to become). While ontogeny (q.v.) is a term expressing the development (embryology) of the individual, phylogeny means the development or genetic history of the members of the group or class as a whole. The conception of such a process did not arise until a multitude of facts had been accumulated during the study of the embryology of different animal types, the results being further checked and complemented by the facts of paleontology. The doctrine or theory of phylogeny, then, rests (1) upon a series of life histories of animals, including their embryonic and postembryonic stages of development; (2) upon what we know of the geological succession of animal forms, and (3) upon the theory of descent. Phylogeny is the equivalent of genealogy and involves the idea of blood relationship. A genealogical tree of a single human family, when carried out through many generations, is almost indefinitely branched and subdivided, the members or descendants from the earliest human pair affording an instance of divergent evolution. The ancestral tree or pedigree of any class of animals is a matter of theory, but the facts of affinity and homology are so numerous and natural that the theory is fairly well grounded. The phylogeny of any group is an expression of one's view of classification, and since in respect to many groups there is a divergence of opinion as to the systematic position of this or that member, so the views as to the pedigree of certain classes or general groups differ with different systematists. The success of the endeavor to work out a phylogeny of any group depends very largely on knowledge of the earlier fossil forms; yet each attempt leads to the more careful study of this or that characteristic, to tracing its growth, development, and final disappearance, or replacement by a later acquired feature,

while the mental discipline resulting tends to render the work of the systematist more philosophical. See EVOLUTION; PALEONTOLOGY.

PHYLOGEOGRAPHY. See GEOGRAPHY.

PHYLUM (Neo-Lat., from Gk *φύλον*, tribe). A term given by Haeckel to the primary divisions of the animal and vegetable kingdoms, which has now generally superseded the old terms "subkingdom," "branch," and "type." A phylum is a primary group either of animals or of plants, all the members of which are supposed to be blood relations descended from one and the same stem, or ancestral, primitive form. The members inherit a mode of development, larval or nepionic stages of postembryonic development, and adult structures which taken together make them differ from those of other phyla. See CLASSIFICATION OF ANIMALS; PHYLOGENY.

PHYSA (Neo-Lat., from Gk *φύσα*, pair of bellows, breath, bubble). A small pond snail abounding in quiet fresh waters throughout the warmer parts of the world. It is closely allied to the *Limnæa*, but the whorls of the amber-



PHYSA

colored shell revolve from right to left, instead of from left to right as is the rule among spiral shells. A very widespread species in the United States is *Physa heterostrophæ*.

PHYSA'LIA. See PORTUGUESE MAN-OF-WAR.

PHYSALIS (Neo-Lat., from Gk *φυσάλλis*, *physallis*, plant with husks like bladders, bladder, from *φυσάν*, *physan*, to blow, from *φύσα*, *physa*, bellows, breath, bubble). A genus of annual and perennial herbs and shrubs of the family Solanaceæ, remarkable for the calyx, which becomes large and inflated after flowering is over and incloses the ripened berry. The species are natives of temperate and warm climates and are widely scattered over the world. The common winter cherry (*Physalis alkekengi*) is a perennial, native of southern Europe and a great



WINTER CHERRY (*Physalis alkekengi*).

part of Asia, growing in vineyards and bushy places. It is also widely scattered in the United States. The berries, which have a sweetish subacid taste, are often eaten. Among the American species perhaps the following are best known: the downy winter or ground cherry, *Physalis pubescens*, the strawberry tomato, *Physalis pruinosa*, *Physalis peruviana*, *Physalis sub-*

glabrata, *Physalis angulata*. Some of these are cultivated in gardens to a small extent. Their fruits make good preserves. In Hawaii the famous poha preserves are made from *Physalis peruviana*. The Chinese lantern plant is *Physalis franchetii*.

PHYSICIA, fis't-a. A lichen. See Plate of LICHENS.

PHYSICAL EDUCATION. That part of education which employs the motor activities of the individual as a means. The term has been used, as in Spencer's *Education*, to include the entire personal hygiene of childhood and youth. Others have understood by it the systematic exercise of the neuromuscular mechanism for the correction of defects or deformities, for the restoration or preservation of health, and to secure ready control of the human machine and right motor habits—a view which makes the physical results the chief or only ones. A better usage, and one more in conformity with the present conception of man's nature as a unit, is that which regards his motor activities as a means of influencing for good the entire individual, in mind and character as well as in body; it employs the word "physical" to denote the means and not the end. "Physical training" is nearly or quite synonymous, with perhaps more emphasis on practice and less on the element of instruction. "Physical culture" is a term of doubtful standing, due in part to its frequent use by charlatans. It suggests pretense and unreliable measures.

History. In ancient Greece the Athenian father was required to provide his son with instruction in music and gymnastics. The former, which included literary branches, reached primarily the intellect and the emotions, while the latter trained the body and the will. The gymnastic exercises, practiced in private schools (*palæstræ*) and usually given out-of-doors, were little more than orderly contests in wrestling, running, jumping, and throwing the spear and the discus. The importance attached to such discipline and the interest it aroused made these same exercises the chief feature of the public gymnasia, which in the time of Pericles every important Greek town seems to have provided for its male citizens, and at the great national festivals which helped to bind together the politically distinct members of the race. Among the Romans military training and the life of the camp furnished the only systematic bodily discipline. During nearly the whole of the period of conquest which led to universal empire, and until within less than a century of the Christian era, every citizen except those of the lowest class was liable to military service for 30 years after his entrance into man's estate.

Formal education throughout the Middle Ages reflects the influence of asceticism, which soon became a part of the accepted teaching of the Church and the practice of a large proportion of her leaders and adherents. Mortification of the body had acquired the dignity of a religious exercise and was viewed as a means and measure of human excellence. In the monastery and cathedral schools, the chief seats of learning from the sixth till the twelfth century, and in the mediæval universities of a later period, physical training therefore had no place. But meanwhile the hermit of early Catholic legends was gradually displaced as a popular hero by the knight, and military Christianity, as typified in the three orders of soldier monks which had

their origin in the twelfth century, could not fail to weaken the hold of the ascetic ideal. The training of the knight stood in sharp contrast to the education imparted in the monasteries, and the tournaments common all over Christendom in the thirteenth and fourteenth centuries afforded a public spectacle no less brilliant, fascinating, and characteristic of the age than were the Panhellenic games.

But it is not until we reach the fifteenth and sixteenth centuries, the period of the Renaissance and the Reformation, that we find men escaping from the authority of that theological dogma which made the soul the one object of solicitude and regarded the body with contempt. Appreciative study of the Greek and Latin classics and all the long-neglected records of ancient civilization supplied the Western nations with a new ideal of life and culture. Writers on education, influenced by their classical studies and also by the customs of chivalry, which had not ceased to shape the early training of the gentleman, now began to speak in commendation of bodily exercise and recognition of its rights to a place in the curriculum, referring constantly to ancient Greeks and Romans as authorities or by way of illustration. It was especially among the upper classes that this interest in physical activities manifested itself. Physical well-being and good carriage as much as intellectual polish now came to be the marks of the gentleman. In this aspect of the educational ideal there coalesced both the ideas of classical tradition and the practices of the courtly and military training of the period. Physical culture and carefully devised gymnastics are accordingly found in the earliest and the most notable of the humanistic schools, that of Vittorino da Feltre at Mantua. The humanistic writers on education have in mind both the physical and moral effects of physical exercises. The tradition thus continued from the classical period was handed on, in turn by the development of special educational practices for the upbringing of the gentry. It may perhaps have been due to the influence of the Protestant Reformation that less attention was given to physical training in the schools more generally attended. In the education of the nobles, in the courtly academies, it played an important part. These schools appeared towards the close of the sixteenth century and flourished in the seventeenth in France, Germany, and England, the influence radiating from the court of Louis XIV. The greatest attention was here given to training in arms and horsemanship, both strongly advocated by Montaigne, but these exercises were supplemented by fencing and dancing. It will readily be noticed how the emphasis was once more shifted; the aim of physical training is now mainly or wholly to develop the social graces. It is clear from this brief account that the world to which John Locke addressed his *Thoughts on Education* (1693) was by no means unprepared for the recommendations he makes on the subject of physical training. But Locke, again, approached the matter from the disciplinary standpoint and emphasizes the importance of hardening the body; his is a return to the Roman practical view rather than the Greek æsthetic ideal; he knew from his own experience how valuable is the sound body as the servant of the sound mind. Rousseau in returning to nature follows much the same principles as Locke, and in laying stress in the *Emile* (1762) on the

value of making a healthy animal of the child before attempting his intellectual training he strikes the note that resounds throughout the following century.

In 1774, after all these centuries of theoretical approval, Basedow founded his *Philanthroponum*, a model school intended to embody his ideas of educational reform, and in this private institution at Dessau, open to all classes of society, bodily exercise was given a place in the daily programme from the start, incorporated into the plan of instruction as an essential factor, and intrusted to one of the regular teachers. Basedow had already spent eight years as professor of moral philosophy and belles-lettres in a school for young noblemen (*Ritterakademie*) at Sorø in Denmark, where, along with teachers of the literary branches, there were professional masters of riding, fencing, dancing, and other exercises. This attempt to combine physical with mental training in the case of youth of a certain class must have given direction to his thoughts, and the appearance of Rousseau's *Emile* doubtless confirmed him in his resolution. The first to be introduced into the new school were the knightly exercises, dancing, fencing, riding, and vaulting; then followed Greek gymnastics, apparently nothing more than systematic practice in running, wrestling, throwing, and jumping; and before the school was closed in 1793 most of the forms of activity advocated since that day had been employed, i.e., simple games and athletic sports, gymnastics, military drill, manual labor and manual training, and school excursions.

A long list of pioneers of the new art now appeared in various parts of Europe. Guts Muths taught gymnastics for nearly 50 years (1786-1835) in Salzmann's Educational Institute at Schnepfenthal and published important volumes on gymnastics, games, swimming, and manual training. Outside of Berlin, from 1810 through 1818, Jahn met boys and young men for exercise, beginning with a few pupils and a little portable apparatus, but later preparing and equipping an outdoor gymnasium and playground, and with the help of squad leaders handling a membership of more than 1000. Out of this voluntary association of turners developed 30 years later the popular gymnastic societies (*Turnvereine*) of Germany, which now number over 11,000 and have a total enrollment of more than 1,000,000 men. Franz Nachteggall, in Copenhagen, started a private gymnasium in 1799, the first institution in modern times devoted exclusively to physical training, and under his leadership Denmark became the first European state to introduce physical training into its schools as an integral part of the course and to prepare teachers of that subject by offering instruction in the theory and method of gymnastics. Under the patronage of the King of Sweden Ling opened in 1814 the Royal Central Institute of Gymnastics in Stockholm, and before his death in 1839 had laid the foundation of Swedish military, medical, and school gymnastics. The last branch was developed into its present form under his son Hjalmar in the third quarter of the century. The chief work of Adolf Spiess, the father of school gymnastics in Germany, was accomplished in the years 1833-55.

In the United States the different systems or sorts of physical training which have been brought forward for trial and the agencies

which have promoted its spread fall into three groups, centred about 1830, 1860, and the decade 1880-90. The first includes Capt. Alden Partridge and his military academies in Norwich (Vt.) and Middletown (Conn.); the introduction of the Jahn gymnastics and the opening of school, college, and city or public outdoor gymnasia under the direction of three German refugees, Charles Beck, Charles Follen, and Francis Lieber; the attempt to provide manual labor as a system of exercise in educational institutions; and the earliest use of calisthenics for girls and women, by Catherine Beecher in her schools in Hartford and Cincinnati. To the second belong the beginnings of college rowing and baseball; the building of the first college gymnasia, at Amherst, Harvard, and Yale, and the establishment of a chair of hygiene and physical education at Amherst; the "new gymnastics" of Dio Lewis; the incorporation of military drill and instruction in colleges and universities organized under the terms of the Morrill Land Bill of 1862; and our earliest acquaintance with the exercises of the Swedish Movement Cure (medical gymnastics). In the third group we find the system introduced by Dr. Sargent at Hemenway Gymnasium of Harvard University; the organization of the American Association for the Advancement of Physical Education (1885), the systematic efforts of German-American gymnastic societies and the North American Turnerbund to make their work known among native Americans, and the introduction of gymnastics into large city school systems by teachers trained in their normal schools; the starting of training courses for physical directors in Young Men's Christian Associations, first at Springfield, Mass., and later in Chicago, and the appointment of a secretary for that phase of Association activity by the International Committee, the Boston conference in the interest of physical training (1889), the introduction of Swedish school gymnastics into America, the opening of a number of normal schools and summer courses for the training of teachers; and the rapid spread of interest in athletic sports and active games.

Theory. Two contradictory views of the human body have at various times profoundly influenced the attitude of educators towards its care and training. One, which we may term the ascetic, reflects the dualistic philosophy of Oriental religions and finds expression in the practices of the Hindu fakir, the Christian saint of the desert, and the Mohammedan dervish. Since evil was believed to inhere in matter of whatever sort, while mind or spirit was essentially divine and pure, soul and body waged perpetual warfare on each other, and the ideal life was one of solitude, contemplation, and strict abstinence from sensual gratification in any form. Through the Alexandrian school of philosophy this tenet found its way into southern Europe very early in the Christian era, and, furthered by an inevitable reaction from the extreme luxury and self-indulgence which characterized the decadent pagan society of the Roman Empire and by the effects of persecution, which led to a glorification of martyrdom and caused pain and torment to be considered meritorious of themselves, it gave its impress to Christianity. Since mediæval education was almost wholly in the hands of the Church, the monastic discipline in all its severity came to

be regarded as a necessary part of the scholar's life.

According to the second view, the biologic or physiologic, the body is a machine with which man does his work in the world. Care and training are requisite in order that it may be perfect in all its parts at maturity and handled skillfully and economically. John Locke advises parents to "keep the body in strength and vigor, so that it may be able to obey and execute the orders of the mind," and Rousseau says that "a good servant ought to be robust. . . . The weaker the body, the more it commands; the stronger it is, the better it obeys." Huxley and Spencer, as might be expected, give fuller and more forcible expression to the same conception. Perhaps the strongest argument in favor of physical training to be drawn from the biological point of view is yielded by a study of the part which motor activity has played in the evolution of organs through the ascending scale of animal life. Professor Tyler, in his *Growth and Education*, presents it at some length. "The development of the heavy fundamental muscles," he concludes, "necessitated and stimulated the development of our vital organs, heart, lungs, and kidneys. These form a closely related group. Muscular exercise is still necessary for the development and maintenance of these organs in the individual man or child. They respond to muscular stimuli as they never do to those of the brain." The muscular system is also "the key to the development of the brain. . . . Nervous development followed the increase of locomotion and increased use of the sense organs, especially of the eyes. Arboreal life and the use of the hand were exceedingly important factors in the development of the cortex. . . . Mental exercise of a logical sort has added only the finishing touches to the development of the brain. It originated as a switchboard between sensory stimuli and muscular movement. It is still a part of the great neuromuscular system. Brain and muscle are never divorced in the action of healthy higher animals or of healthy men." In the case of the human being physical exertion has been an almost universal condition of existence down to recent times, and to it we largely owe our present type of body.

This view of the body as the servant of the mind, and the recognition of good health and motor activity as fundamental to sane and happy living, have led to the general introduction of courses in hygiene and the rudiments of human physiology into the curriculum of our schools and colleges, and to widespread attempts to supply facilities for bodily exercise, with more or less provision of expert oversight and systematic instruction. Such steps mark a noteworthy advance in the right direction, and yet they indicate only a partial grasp of the real significance and purpose of physical training, so called. For there is still a third view of the relation of body and mind, the psychophysic, which finds increasingly clear and forceful expression in the recent home and foreign literature of physical training, particularly that relating to playgrounds and athletic sports, and which suggests that hitherto we have barely crossed the threshold of opportunity and obligation. From the time of the Athenian philosophers down to the present day men have always realized, more or less consciously, that in some way or other the entire individual is reached through his

motor activities and is involved in them. Mind and body are interdependent, and what we have been calling physical training, if properly applied, may make direct and most important contributions to the intellectual, social, and moral progress of the child and youth.

As late as the middle of the last century it was still true that the farm, and in the town the home with its chores about house, barn, yard, and garden, provided for a large majority of the young a motor training that was in many respects ideal. But now, with an abruptness of transition that is fairly startling, the massing of population in cities and the substitution of machinery for human muscle have practically banished these factors in education from the lives of all but a few. The community, then, is confronted with a new problem, one which hitherto the family has for the most part been left to solve for itself. It must not only safeguard the bodily welfare of the child under the changed conditions and in a variety of ways undreamed of by our fathers; it must also take over the task of providing the growing boy and girl and the adolescent with an amount and kind of motor training which will be sufficient for his needs at every stage of growth and development. The gymnasium and the playground have become a necessary part of the educational plant, and the school is called upon to extend its curriculum and enlarge its powers in order to incorporate and control these educational agencies. Its task is a fourfold one: first, to conserve the health of the individual pupil and the group; second, to give instruction in the essentials of personal, domestic, and public hygiene; third, to provide systematic and progressive physical training throughout all but the earlier years; and fourth, to organize and supervise the activities of the playground and the athletic field.

Regarding the reasons for the third measure, and the manner of carrying it out, there is still a surprising confusion of ideas, even among men who have made a professional study of the subject and who occupy conspicuous positions of leadership. Play, games, athletic sports, and the various forms of dancing, although their value can hardly be exaggerated, are no more able to take the place of formal gymnastics than are the popular magazine, the picture show, and the public library to serve as substitutes for the orderly discipline of the school and college. There are drooping heads and shoulders, bowed backs, and flat chests which must be made to yield to carefully chosen corrective exercises. The rudiments of neuromuscular control must be acquired through frequent practice of varied forms of movement graded according to difficulty and advancing from the simple to the complex. The confinement of the classroom must be offset by vigorous use of the large, fundamental groups of muscles—those of the shoulders, trunk, and legs, whose contractions stimulate the activity of heart, lungs, and skin. The foundations of self-reliance, courage, and decision of character must be laid by means of exercises that call for the overcoming of some difficulty, or that present the element of danger involved in hanging and swinging by the arms and in jumping and vaulting over obstacles.

But the hour or so a day devoted to formal physical training is far from supplying all the motor activity required for the normal development of the child and youth. It is desir-

able that a still longer time be spent on the playground and athletic field. Here organization and supervision are again demanded, but only with the object of giving each individual a chance to play and of preventing the few from usurping facilities that all should enjoy. Freedom for self-expression and self-control, subject only to the rules of the game and the dictates of true sportsmanship, are the very essence of play. Social and moral training are chief among its benefits, and the teacher's business is to suggest and lead, not to dictate or compel.

Practice. For 50 years or more systematic physical training has formed a regular part of primary and secondary education in most Continental countries, and in Denmark and Sweden the beginnings date back a full century. In the United States, on the contrary, the movement to incorporate such discipline in the school system is still in its infancy. The first serious attempts on any large scale, if we omit a few sporadic cases, fall in the second half of the decade 1880-90, and we cannot be said to have advanced as yet beyond the experimental stage. American colleges and universities, however, have generally taken the step, and in them physical training has reached its highest point of development in America, although the measures adopted leave much to be desired. It is evident, then, that a study of the chief European types or systems is the necessary starting point in any discussion of practice. These can all be reduced to four elemental forms—the German popular gymnastic society (*Turnverein*), German school gymnastics, Swedish school gymnastics, and the games and sports of the English public schools and universities. The first named, which has been widely copied in other countries, affects directly adults and older youths only and therefore lies outside the main purpose of the present article.

It is difficult to characterize the German system in a few words, for in the absence of an Imperial bureau of education each of the 26 states manages its own school affairs independently, and numerous differences of detail exist. To the English or American visitor the most striking fact is the universal inclusion of gymnastics as a part of the curriculum in elementary and secondary schools alike and the provision of fully equipped indoor and outdoor gymnasia, at least in the case of the larger cities. Instruction in the elementary schools is given by the regular grade teacher, whose preparation in this, as in all other subjects, is received in some one of the many state or private training colleges. Official or semiofficial manuals have been published in some states for the guidance of such teachers, and there are city, provincial, and state officers charged with the duty of supervision and inspection. In the secondary schools instruction is in the hands of a member of the staff who teaches some other branch or branches as well (the *Auch-Turnlehrer*), or it is intrusted to a professional teacher of gymnastics (the *Nur-Turnlehrer*). Whichever plan is followed, the instructor must have passed a special state examination, or completed a course at one of the five state normal schools of gymnastics (*Turnlehrerbildungsanstalten* or *Landesturnanstalten*). These latter are located at Spandau, Dresden, Munich, Stuttgart, and Karlsruhe, and the length of the course varies all the way from a few weeks (Karlsruhe) up to two years (Munich). Re-

cently courses in the theory and practice of physical education have been introduced in each of the 10 Prussian universities, and in at least three others (Heidelberg, Jena, and Leipzig). Thus the student is enabled to prepare for the state examination, and in most cases to take it, at the university where he is pursuing other studies. The time allotted to gymnastics is three one-hour periods a week in Prussian secondary schools. Some of the remaining states require the same number, and others provide for two lessons only. Each lesson usually begins with class exercises in marching, or with exercises performed either with no apparatus at all or with only a wand or a pair of dumbbells in the hands, and then the class is divided into squads for work at two different pieces or sorts of apparatus—one permitting hanging and climbing exercises and the other jumping and vaulting. Nowadays it is becoming customary to substitute a throwing or running game, or some simple athletic event, for one set of exercises on apparatus.

The Swedish system of school gymnastics, as practiced in its native country, presents a number of distinguishing features. Each teacher in the elementary schools is expected to give the gymnastic lesson to his (or her) own pupils, unless the city provides special teachers, and as in Germany the requisite preparation is given in the various state and private training colleges. These colleges, and every secondary school in Sweden, must have on the staff a professional teacher of gymnastics who has completed a two-year course at the Royal Central Institute of Gymnastics in Stockholm. Hitherto the physical training in boys' schools has been almost altogether in the hands of officers in the army and navy, and they far exceed the civilians among male students in the Central Institute. Except for the general absence of hand apparatus, the Swedish school gymnasium usually possesses quite as complete and varied an equipment as will be found in any other country. Its most peculiar features are the stall bars, long double horizontal bars, and a sort of lattice ladder. The law requires three hours of instruction in gymnastics each week throughout the entire course in secondary schools, and this may be given in daily half-hour periods or in longer ones at less frequent intervals. Lessons conform more or less closely to the so-called "day's order." This is based on a careful selection of types of exercise made with certain specific needs of the pupil in mind, a grouping of the exercises not by the apparatus employed but according to the effects they produce, and a sequence of these groups intended to secure a maximum of result with a minimum expenditure of time and effort.

Quite unlike the formal training of the German and Swedish schools are the outdoor games and sports which long formed a distinctive feature of the English public schools, such as Eton, Harrow, Rugby, and Winchester, and the older universities. In these schools was developed primarily the formation of character as the aim of education, based largely on the development of initiative and independence in social and physical activities outside the classroom. This ideal was early adopted by the older grammar schools and until recently was associated almost wholly with secondary education. Within the last few years this ideal has begun to spread and to be adopted gradually but surely in the elementary

schools as well. Ample playgrounds are considered a necessary provision of most secondary schools and are required by the Board of Education regulations in elementary schools. In both grades of schools playing fields, if not accessible close to the school, are rented outside. In the boarding schools and those which more closely imitate the character of the older public schools regular participation in some variety of outdoor exercise is practically compulsory for every one who is not excused for medical reasons. In the day secondary schools, where the pupils live at a distance from the schools, this compulsion is of course impossible, but even under these circumstances it will be found that a good proportion participates. In the elementary schools the Board of Education since 1906 recognizes the introduction of organized games as part of the curriculum, and one morning or one afternoon each week may be devoted to them as part of the regular work, while there is, of course, no restriction on voluntary games after school hours. The usual practice in the case of elementary schools is to make use of the public parks. In the secondary schools sports and athletics are managed by the pupils themselves, always with the encouragement of several teachers. Interclass, interhouse (in the case of boarding schools), and interschool contests afford ample opportunities for competition and exercise in addition to the ordinary practice. In the elementary schools interscholastic leagues are found everywhere, and in a few cases intercity school athletic leagues have been formed. Football (both Rugby and Association), cricket, hockey, and lacrosse, and for girls hockey and basketball, are the games most frequently found. Rowing has been developed in the older public schools and a few secondary schools. The same interest and devotion to sports and athletics prevail at all the universities, where the numbers participating are sufficiently large to permit of the organization of several teams for each game. At Oxford and Cambridge the different colleges also serve as units for rivalry, while the newer universities play against each other and against first-class local teams. Since the masters of the secondary schools are not infrequently appointed for their interest in athletics as much as for scholarship, it will be readily seen how the national ideal is kept alive and fostered throughout the country.

As might be expected, these three types of physical training, arising independently, have begun to react upon each other and have been copied in more or less modified and composite form by the educational authorities of other countries. Books on education in England published by Paschal Grousset and Baron Pierre de Coubertin in the decade 1880-90 exerted a profound influence on French thought and directed attention to the great importance of vigorous open-air exercise. Since 1891 Germany has had a Central Committee for Promoting Active Games and Athletic Sports, which has conducted a well-organized and successful campaign. The Scandinavian countries have been similarly affected, and there are corresponding societies in both Norway and Sweden. On the other hand, the spread of the Swedish system of school gymnastics in the last few decades has been equally noteworthy. It has won the attention and modified the practice of German and Swiss teachers, made considerable

headway in France and Belgium, and almost entirely replaced the older *Nachtegall* gymnastics in Denmark. England has been slow to adopt formal training, but now the army and navy manuals and the *Syllabus* of the Board of Education, prescribed for elementary schools, are based upon the Swedish system. It has also been introduced as a general requirement at Eton and Rugby, to supplement the effects of outdoor sports, and most of the large secondary schools now have well-equipped gymnasia.

In the United States, wherever physical training has been made a part of the public-school curriculum it has usually followed either the German or the Swedish type, but too often without the equipment which would be considered indispensable in other countries. The colleges and universities, as a rule, possess fairly adequate gymnasia and organized departments of physical education in charge of regular members of the faculty, who are more commonly graduates in medicine. Most of these institutions provide and require a year or more of systematic exercise, and it is the growing practice to grade the student for this as for other courses and to include the credit given for it in the total number of hours necessary for graduation. The director of the gymnasium is often the instructor in hygiene also, and in a majority of cases he stands in some official relation to the different athletic teams. Each student upon entering the institution receives a medical examination and is variously measured and tested, to determine his physical condition and to yield data with which the results of later examinations may be compared. The amount of time given to formal gymnastics and the methods pursued in teaching differ widely. Professional preparation for the work of physical education is still very largely acquired in special privately owned normal schools or in summer courses. The Young Men's Christian Association supports two training schools, in Springfield (Mass.) and Chicago, and the North American Turnerbund conducts a Normal College in Indianapolis. Here and there State normal schools and endowed teachers' colleges provide training in this subject. Most significant is the fact that an increasing number of universities and colleges now offer more or less extensive teachers' courses in physical education, counting towards the bachelor's degree.

Bibliography. For the history: F. E. Leonard, *Pioneers of Modern Physical Training* (2d ed., New York, 1915), also a guide to the literature. For the study of theory: Konrad Koch, *Die Erziehung zum Mute durch Turnen, Spiel und Sport* (Berlin, 1900); Hough, "A Review of Swedish Gymnastics," in *Report of the Commissioner of Education, 1898-99*, vol. i (Washington, 1900); L. H. Gulick, *Physical Education by Muscular Exercise* (Philadelphia, 1904); D. A. Sargent, *Physical Education* (Boston, 1906); J. M. Tyler, *Growth and Education* (ib., 1907); also the *Proceedings of the American Association for the Advancement of Physical Education* (10 vols., 1885-95), and the *American Physical Education Review* (begun in 1896, now published in Springfield, Mass.). For practice: consult the bibliography under GYMNASIUMS, which contains a list of the most important manuals and handbooks.

PHYSICAL FORCE PARTY. In British politics, the term frequently applied to the

party of Young Ireland which advocated physical force as against constitutional agitation to free Ireland from English oppression. It was most active at the close of the eighteenth century under the leadership of Tone and Emmet, in the middle of the nineteenth century under Mitchel, when the name was most frequently applied, and again, under the name of Fenianism, in 1858, 1865, and 1867.

PHYSICAL GEOGRAPHY. See GEOGRAPHY; PHYSIOGRAPHY.

PHYSICAL OPTICS. See LIGHT.

PHYSICAL SOCIETY, AMERICAN. A learned society organized for the advancement and diffusion of the knowledge of physics. It is one of the affiliated societies meeting with the American Association for the Advancement of Science. It also holds four meetings a year for the reading and discussion of papers upon the subject of physics.

PHYSICAL SOCIETY OF EDINBURGH, ROYAL. A learned organization of Scotland, instituted in 1771 and incorporated by royal charter in 1788. Its object is the "promotion of zoölogy and other branches of natural history," including anthropology, paleontology, and evolutionary theory. Discussions take place at monthly meetings held in the Philosophical Institution, Edinburgh, where the society possesses a large and valuable reference library. The membership is divided into three classes—fellows, corresponding fellows, and honorary fellows, the number of the last named being limited to 15. For over a century the society did not print its transactions, but now publishes an annual volume of *Proceedings*, the first volume having been issued in 1854-56. This is one of the most important zoological journals published.

PHYSICAL SOCIETY OF LONDON, THE. A learned society, founded in 1874, with its office and reference library in the Physical Laboratory of the South Kensington Museum, which has since transferred its official headquarters to Burlington House, London. Its object is to promote the advancement and diffusion of a knowledge of physics and for that purpose to have papers read, new apparatus shown, and experiments tried at its meetings, which it holds fortnightly. The society publishes *Proceedings*, which are issued quarterly and contain the more important papers read at the meetings as well as the official records of the society.

PHYSICIAN (OF. *physicien*, *fiscien*, from Lat. *physicus*, from Gk. *φυσικός*, *physikos*, natural philosopher, physician, from *φύσις*, *physis*, nature, from *φύειν*, *phyein*, to produce). In law, one who is entitled to practice medicine or surgery. Specifically one who has complied with all State regulations in regard to the study of medicine and who may lawfully practice the healing art. Most States require a medical student to pass a State examination satisfactorily and thereupon grant a license to practice to successful candidates. It has been held that such statutory restrictions are justified in the public interest and are not an improper interference with the liberty or property of the persons affected thereby. A person who holds himself out as a physician is considered to represent that he has the ordinary skill of one of his profession. Lack of skill or negligence on the part of a physician, resulting in injury to a patient, is called malpractice (q.v.) and sub-

jects the practitioner to an action for the damages sustained. The practice of medicine is not, however, a public calling, and it is therefore optional with a physician whether or not he will attend a person calling him.

The relation of a physician and patient is a confidential one, and the former is bound not to divulge any of the secrets confided to him by the patient, even on the witness stand. The statutes of each State in regard to the practice of medicine should be consulted. See EVIDENCE; MAJ PRACTICE.

PHYSICK, fiz'k, PHILIP SYNG (1768-1837). An American physician, born in Philadelphia and educated at the Friends' Academy. In 1788 he went to Europe, studied with John Hunter, and was admitted to St George's Hospital in 1790. In the same year he received a diploma from the Royal College of Surgeons and assisted Dr. Hunter for one year. In 1792, after attending one session, he received his degree from the University of Edinburgh. Returning to Philadelphia in 1793, he was appointed physician at several hospitals and in 1805 became professor of surgery in the University of Pennsylvania. In 1819 he was called to the chair of anatomy, which he filled until 1831. Physick introduced the use of absorbable kid ligatures, performed an operation for artificial anus, invented a tonsillotome, etc.

PHYSIC NUT (*Jatropha*). A genus of about 70 species of tropical shrubs and trees of the family Euphorbiaceæ, characterized by alternate, stalked, angled, or lobed leaves, corymbs of flowers on long stalks, and the acrid oil of their seeds. The common physic nut (*Jatropha curcas*) of the East Indies, introduced into the West Indies, southern Florida, and other warm parts of the world, is a small, much branched,



PHYSIC NUT

rapidly growing tree or bush with a milky juice. It is used for fences in many tropical countries. The expressed oil, commonly called jatropha oil, is used for illuminating purposes and has been used in medicine. The French or Spanish physic nut (*Jatropha multifida*), an American shrub with many-lobed leaves, yields an acrid oil, called oil of pinhoen. To this genus belongs the pinoncillo (*Jatropha lobata*) of Peru, the roasted seed of which is an agreeably flavored food. Incisions in the stem of

this tree allow the escape of a clear, bright, powerfully caustic liquid which after some time becomes black and horny and retains this property for years. Physic nettle (*Jatropha urens*), a native of the southern United States, has similar qualities.

PHYSICS (from Gk. φυσικά, *physika*, nom. pl. neut. of φυσικός, *physikos*, relating to nature). Physics is one of the successors of the study formerly called natural philosophy, or the science of the phenomena of nature as revealed to us by our senses and as interpreted and systematized by our intellects. The name itself is the plural of the word "physic," which was used as early as the fourteenth century to mean natural philosophy, but which afterward became restricted to mean the science of medicine and finally to mean a medicine or drug itself. While physics in its modern sense comes closely in contact with chemistry, astronomy, and many other sciences, it is impossible to state in words its exact scope. It may be said, however, in general that the study of physics includes the phenomena of acoustics, of heat, of light, of electricity and magnetism, and of mechanics to a certain extent. There are two great divisions of physical methods: one may be called the laboratory method, the other the method of mathematical physics. (See LABORATORY.) The laboratory method consists, first, in making a series of observations and amassing information in regard to phenomena, but further in seeking to obtain a generalization with which the observed phenomena may be in accord. The fundamental method of mathematical physics is to devise certain postulates and to state such axioms as will lead by rigid mathematical processes to formulæ which may be compared with observed phenomena. Thus, by means of the methods of logic, conclusions may be drawn connecting many phenomena which on their face are unrelated.

History. It is remarkable to note how few facts other than obvious ones were known to the ancients in regard to nature and also to find how few instruments were available for what may be called scientific observation. Beyond a doubt simple forms of instruments were known for the measurement of time, such as water clocks, sundials, etc., and the Chinese at least had a knowledge of some of the simple properties of a magnet. The law of the reflection of light was generally known, and lenses were in use for various purposes. The law of the lever was known to Archimedes, as were also certain of the laws of hydrostatics. There was a knowledge of harmony in music more or less incomplete. A few observations are also noted in regard to electric attraction and the facts of meteorology.

Up to the Middle Ages there are few if any facts to be recorded in regard to the growth of natural philosophy, because the Romans were content with the knowledge left them by the Greeks, and the intellectual activity of the Arabs seemed to be concentrated, as far as physics is concerned, in the person of Alhazen, who was interested largely in optics. There was a revival of interest in nature during the thirteenth century, as shown by the work of Roger Bacon and Peregrinus. In the sixteenth century Copernicus lived, and he was followed by Galileo, Kepler, Stevin, Gilbert, and others. Galileo's greatest contribution to physics was the statement of the principles of mechanics.

He was succeeded by pupils whose interest and influence were so great that they led to the establishment of academies and learned societies throughout Europe. With the appearance, however, of Huygens's *Horologium Oscillatorium* (1673) and Newton's *Principia* (1687) physics came to the front as the most important of the sciences. The methods used by these two men, both in their observations and in their statement of laws of nature, have served as the models for succeeding generations. They were followed by two schools—one interested in the mathematical development of mechanics, the other interested in the purely experimental side of the subject—whose legitimate predecessors were Torricelli, Pascal, Boyle, and Guericke.

Modern Times. The development of our present knowledge of physics is more fully described under the separate headings of its various subjects, viz., ACOUSTICS, HEAT, LIGHT, ELECTRICITY, and MAGNETISM. It should be sufficient in this place to refer to a few names in connection with each of the subjects. Our accepted ideas in regard to the nature of heat and heat effects are due to the researches and theories of Black, Rumford, Davy, Carnot, Clausius, and Joule. In light we owe most to Young, Fresnel, Fraunhofer, Kirchhoff, and Stokes. In the subjects of electricity and magnetism a long list of names should be mentioned, but among these those of Volta, Cavendish, Ampère, Oersted, Faraday, Henry, Gauss, Weber, Maxwell, and Kelvin are easily the most notable. To Helmholtz alone, it is only fair to say, all of our accepted ideas of the theory of sound are due. The names of no living men have been included in the above summary, but any such list would be incomplete without the addition of the names of Rayleigh, Lorentz, J. J. Thomson, Larmor, and Rutherford, who have contributed so much to the most recent ideas in regard to the fundamental concepts of nature.

Previous to the nineteenth century there were three great principles of physics which were firmly established and which deserve to be called laws of nature. These were the law of gravitation, the principle of the conservation of matter, and that of the conservation of momentum. The most notable fact in the history of physics during the nineteenth century was the development of the principle of the conservation of energy and its application to all fields of science. This great development was due largely to the efforts of J. R. Mayer, Helmholtz, and Joule. Other great principles, such as the second law of thermodynamics, were expressed in words and will be found discussed in other places. The kinetic theory of matter was also elaborated and established on a firm basis.

Beginning with the discovery of the X rays by Röntgen in 1895 and of the radiation from uranium by H. Becquerel in 1896, there has been a progress in physics and in our knowledge of the properties of matter which has been one of the most striking facts in the whole history of science. The point of departure in our new knowledge comes from the epoch-making discovery by J. J. Thomson that in their passage through air both the X rays and those from uranium make the air a conductor for electric currents. This discovery led at once to investigations by observers the world over in regard to the nature of the ionization of air and of the radiations which produce it. It was soon found that many substances other than uranium had

this same power of emitting radiations which would ionize a gas; such were thorium and the newly discovered elements, radium and polonium. These substances are said to be radioactive. (See RADIOACTIVITY.) The properties of the radiations themselves were carefully studied and analyzed, and their properties other than that of ionization were investigated. There are always present in the radiations from such bodies both positively and negatively charged particles of matter, whose velocities vary within wide limits. When the velocities of the negatively charged particles as produced in various ways were studied, a most remarkable fact was observed. Attention had been called many years ago by J. J. Thomson to the fact that if a charged sphere were moving rapidly it would have an effective inertia greater than that which would be observed in case it were uncharged. In other words, an electrical charge in motion has an apparent mass quite apart from that of the matter carrying it, and formulas have been deduced by Thomson, Lorentz, and Abraham connecting this mass of the charge with the quantity of charge and its velocity. It was observed in the case of the negatively charged radiations above referred to that their apparent mass was exactly that which would be calculated from the formulae on the assumption that the mass was due entirely to the moving charge. This discovery renewed at once the theories of matter which had been advanced before, in accordance with which the inertia of matter is a property due to the motion of an electric charge. The name "electron" has been given these charges when considered apart from matter, and a most interesting discussion of their properties and of the theories of matter based upon these is given in a series of papers by Sir Oliver Lodge in the *Electrician* (London) during the winter of 1902-03.

One of the great contributions of the nineteenth century to physics was the development of the idea of the luminiferous ether. The necessity of a medium for the transmission of the waves which produce the sensation of light had been recognized for many years and was clearly stated by Fresnel and others. Faraday had also come to the conclusion that a medium was necessary for the transmission, or rather existence, of electric and magnetic forces and had suggested that possibly this medium might be identical with the one that carried "light waves." Maxwell showed by theoretical considerations that the velocity with which an electromagnetic disturbance would be propagated in the medium referred to by Faraday must be numerically equal to the so-called "ratio of the electrical units" and further showed from experimental evidence that this was equal to the number expressing the velocity of light. He also proved by a mathematical investigation that the electromagnetic waves were identical in all respects with those with which we are familiar in the phenomena of light and thus established the fact that only one medium is necessary for the explanation of the phenomena of light, electricity, and magnetism. The connection between this ether and ordinary matter has been investigated by many observers, as described in the article on ETHER. The accepted theory at the present time is that the ether does not move as material bodies are carried through it, and this, in connection with the ideas of electrons, has been elaborated by Lorentz into a theory

which is able to explain in the most satisfactory manner the phenomena of dispersion, metallic reflection, and stellar aberration. There are many difficulties, however, which still remain to be investigated in regard to the properties of the ether, in spite of the great progress marking the beginning of the twentieth century. It is only fair to note that there is a school of mathematical physicists who in stating the laws of nature do not make any assumptions as to the existence of the ether. See RELATIVITY.

Bibliography. General: Kelvin and Tait, *Elements of Natural Philosophy* (Cambridge, 1894); id., *Treatise on Natural Philosophy* (2 vols., ib., 1895-96); O. D. Chwolson, *Lehrbuch der Physik* (4 vols., Brunswick, 1902-13); A. Winkelmann (ed.), *Handbuch der Physik* (6 vols., Leipzig, 1903-06); J. S. Ames, *Text-Book of General Physics* (New York, 1904); Müller-Pouillet, *Lehrbuch der Physik* (10th ed., 4 vols., Brunswick, 1905-06); Poynting and Thomson, *Text-Book of Physics* (5th ed., 3 vols., London, 1909-11); William Watson, *Text-Book of Physics* (New York, 1911); Alfred Daniell, *Text-Book of the Principles of Physics* (new rev. ed., ib., 1911); Henry Crew, *General Physics* (ib., 1911); Kelvin, *Mathematical and Physical Papers* (6 vols., ib., 1911); J. S. Ames, *Constitution of Matter* (Boston, 1913); E. L. Hancock, *Applied Mechanics for Engineers*, revised by N. C. Riggs (New York, 1915); also *The International Catalogue of Scientific Literature: Physics* (London, 1902 et seq.), a complete bibliography of current publications. History: G. F. Barker, *Account of Progress in Physics and Chemistry in Years 1879-86* (Washington, 1882-89); Florian Cajori, *History of Physics in its Elementary Branches* (New York, 1899); W. C. D. Whetham, *Recent Development of Physical Science* (4th ed., London, 1909); Seneca, *Physical Science in the Time of Nero: Being a Translation of the Quaestiones Naturales*, by John Clarke (New York, 1910). Periodicals: *American Journal of Science* (New Haven, 1818 et seq.); *Journal de physique* (Paris, 1872 et seq.); *Annalen der Physik* (Leipzig, 1877 et seq.); *Zeitschrift für Instrumentenkunde* (Berlin, 1881 et seq.); *Zeitschrift für physikalische Chemie* (Leipzig, 1887 et seq.); *Physical Review* (New York, 1893 et seq.); *Astrophysical Journal* (Chicago, 1895 et seq.).

PHYSIOCRATS, fiz'î-ô-kräts (from Gk. φύσις, *physis*, nature + κρᾶειν, *kratein*, to rule). A French school of political and economic philosophers, known to their own generation as *Les Economistes*, who wrote against the antiquated methods of the state in encouraging industry (see COLBERT), and in favor of agriculture, industrial freedom, and natural liberty. The school flourished from 1756 to 1776. The founder and leader of the school was François Quesnay (q.v.), a noted surgeon, metaphysician, and, after 1749, physician to Madame de Pompadour. With Quesnay is often associated in the founding of the sect the name of Jacques Claude Marie Vincent de Gournay (q.v.), who did not, however, indorse the extreme views of the school respecting the paramount economic importance of agriculture. The most earnest disciples and indefatigable propagators of the physiocratic doctrine were the elder Mirabeau, Mercier de la Rivière (1720-94), and Dupont de Nemours (q.v.), editor of the works of Quesnay and Turgot and of the physiocratic journals. Among the statesmen, rulers, and princes of the

time who accepted the main doctrines of the physiocrats were, first and most important, Turgot (q.v.), Minister of Finance under Louis XVI; Charles Frederick, Margrave of Baden; Gustavus III of Sweden; Leopold II, Grand Duke of Tuscany, and afterward German Emperor; Stanislas of Poland; the Emperor Joseph II; and Charles III of Spain. With some of them the acceptance was little more than half-hearted, and the only monarch who made an earnest attempt to carry out their programme of reform was Charles Frederick of Baden. He tried to apply their principles in three villages, but finally abandoned the attempt.

The general doctrine of the physiocrats was an extension to the economic sphere of the theory of natural liberty which Locke, Hutcheson, Shaftesbury, and others had applied to the sphere of politics and religion; but, unlike the British philosophers, the physiocrats denied that the natural rights of the individual could be abridged by any social contract. Every man, they held, has a right to the free exercise of his faculties so long as he does not infringe the like liberty of others, and this involves the further right to the undisturbed enjoyment of the property which results from the exercise of his faculties in productive labor. It follows from these rights that the sole function of government is to protect life and property and to administer justice, and no interference by the government with commerce and industry is permissible—in the classic phrase of the school, *laissez faire, laissez passer* (q.v.)—but within the restricted sphere noted above the physiocrats advocated a strong monarchical government, a "legal despotism, tempered only by an enlightened public opinion."

The peculiar economic views of the physiocrats seem to rest upon a confusion of wealth with material objects, leading to the conclusions that agriculture alone yields a surplus product—*produit net*—above the expenses of production; while manufactures and commerce, which merely change the form or position of raw materials, are barren. As agriculture is the only form of production yielding a value in excess of the cost of production, they advocated that taxes should be levied upon rent—which expresses or measures the "net product"—so as to avoid the expense and friction attendant upon the shifting of the tax to this source when placed originally upon other objects. They thus gave to political economy the fruitful theories of surplus value and the single tax, *impôt unique*. (See POLITICAL ECONOMY.) The scientific virtues and defects of the physiocrats may be traced to one and the same cause, the belief in a beneficent and absolute natural law governing the moral and social universe with the same rigidity and precision as the material universe is governed by physical law. This belief made them at once narrow but precise, systematic but unmindful of the difference between physical and psychical phenomena, careful in definition, distinction, and classification but careless of the effects of customs, law, and the diversity of human motives. They have exercised a deep and lasting influence upon political economy. Opinions differ regarding their influence upon the practical affairs of the day. They undoubtedly stimulated the study of agriculture, suggested several important agricultural improvements, called attention to the oppression of the peasantry and elevated their importance in the eyes of the nation, and secured

a freer intercourse of trade, particularly in breadstuffs, within the French Kingdom. In the early years of the French Revolution their doctrines exercised an appreciable effect upon the Constituent Assembly, but their most striking practical influence was exercised through Turgot (q.v.), who, while not a professed physiocrat, made many earnest attempts, both as Intendant of Limoges (1761-74) and as Comptroller General of Finance (1774-76), to abolish the *corvées* and the guilds, to introduce free trade in corn, to reduce taxation, and to accomplish the general reforms which the physiocrats demanded.

Among the most important publications of the physiocrats are Quesnay's articles on *Fermiers* and *Grains*, published in the *Encyclopédie* of Diderot and D'Alembert; *Le droit naturel*, published with other of his writings in the *Physiocratie* (which gave the school its name), edited by Dupont de Nemours; and his *Tableau économique* (1758), "the Bible of the Physiocrats," reprinted for the British Economic Association (London, 1894); Mirabeau's *Théorie de l'impôt* (1760) and *Philosophie rurale* (1763); Dupont de Nemours's *De l'origine et de progrès d'une science nouvelle* (1767, published in his *Physiocratie*); Mercier de la Rivière's *L'Order naturel et essentiel des sociétés politiques* (1767); Turgot's *Réflexions sur la formation et la distribution des richesses* (1770).

Bibliography. August Oncken, *Œuvres de Quesnay* (Frankfort, 1888); W. Hasbach, *Die allgemeinen philosophischen Grundlagen der von François Quesnay und Adam Smith begründeten politischen Oekonomie* (Leipzig, 1890); H. Higgs, *The Physiocrats* (London, 1897); August Oncken, *Geschichte der Nationalökonomie* (Leipzig, 1902); G. Weulersse, *Le mouvement physiocratique en France de 1756 à 1770* (Paris, 1910).

PHYSIOGNOMY (Fr. *physionomie*, from Gk. *φυσιογνωμία*, *physiognōmía*, art of judging by the features, from *φύσις*, *physis*, nature + *γνώμων*, *gnōmōn*, judge). See **PHRENOLOGY**.

PHYSIOGRAPHY (from Gk. *φύσις*, *physis*, nature + *-γραφία*, *-graphia*, description, from *γράφειν*, *graphein*, to write). There is much difference in the usage of the term "physiography." It is employed as a synonym for the older term "physical geography"; as a term to include a general introduction to science; for the study of the physical environment of life; and for the study of land forms alone, i.e., as a synonym for the name "geomorphology," proposed some time ago. In the United States the term "physiography" is rapidly coming to replace the older term "physical geography," at the same time that a more scientific basis is being introduced into physical geography. In this sense physiography is concerned with the study of air, ocean, and land, with the object of understanding their present condition and influence on life. To understand present conditions leads back into meteorology, oceanography, and geology; to appreciate their influence on life presupposes at least knowledge of history and biology. It is no uncommon belief that physiography is too complex and draws upon too many other subjects to have distinct boundaries and hence to deserve the name "science." It is true that there is no general agreement as to the exact boundaries, but this is by no means proof that physiography can have no boundary. Some one has said that geology is a study of the past. That is to say,

a geologist, to appreciate his subject fully, must have knowledge as a physiographer; and a physiographer must know the past that he may use geology as a tool in his attempt to understand the present.

Astronomical Aspects. The study of physiography deals essentially with the earth—its spherical form, its envelopes of air and water, its cold crust and heated interior, and their influence on life. Yet no thorough appreciation of these conditions and influences is possible without a general knowledge of the astronomical relations of the earth. The earth as a sphere and as a member of the solar system in which it so moves as to give day and night and the seasons are facts of fundamental importance to an understanding of changes in the earth; and the spherical form of the earth and the presence of heat among the members of the solar system furnish adequate reason for a consideration of the hypotheses for the origin of the earth. This does not mean that the subject encroaches on astronomy; it is dealing with the earth, but it inquires of astronomy the reasons for terrestrial phenomena of vital importance and applies these to an interpretation of the phenomena in their relation to life.

Air. The influence of the air on life is universal. Its oxygen and carbon dioxide; the influence of its pressure; the effects of its density, e.g., on the flight of birds; its water vapor; its winds and their effects—these are among the many reasons why a study of the air properly forms a part of physiography. The science of meteorology furnishes the explanations, and with these the physiographer needs to be familiar. In order that he may understand the distribution of life he should know why there is vapor, why winds blow as they do, why there are rainy and desert regions, and why there are storms. The branch of physiography that deals especially with this phase of the subject is climatology. If the climatologist studies only the causes of climate, he becomes a meteorologist; but if his especial concern is the understanding of the laws of climate with reference to their influence on life, he is a physiographer. The study of the air has a bearing on other phases of physiography. Waves and ocean currents depend on air conditions, and to understand them calls for a knowledge of air movements. Rain, river floods, the difference between the topography of arid and moist lands, and the existence of glaciers are among the features of the land that depend upon a knowledge of the air for their proper appreciation. Each of these reacts on life. Thus, along several lines, it is evident that there is a phase of air study, calling for an appreciation of the science of meteorology, it is true, but with its main object the investigation of the influence of the air on the environment of plant, animal, and human life.

Ocean. The temperature and movements of the ocean, dependent upon sun's heat and air movements; the tides, dependent on the attraction of the sun and moon; the composition of the ocean water, its depth, and the characteristics of the ocean bottom—are among the important physiographic features of the ocean. Each of these has an influence on life. The ocean supplies vapor to the air; its vast expanse and its currents influence the temperature of the air and aid in those movements of the air by which the temperature and rainfall of the lands are profoundly affected. Life in the ocean as in-

fluenced by its environment, the effect of ocean influence on the life of the lands, the ocean as a barrier to the spread of life, and its importance to man in commerce and many other ways are among the subjects with which a physiographic study of the ocean is concerned. The oceans and the lands are profoundly interrelated. The waste of the land is carried to the sea by rain and rivers, and the oceanic agents are attacking the land along its border, forming many varied coast features. Changes in level of the crust lower parts of the land beneath the sea and raise sea bottoms to form dry land. No study of the lands can promise the best results without a knowledge and appreciation of the conditions of the coast line and sea bottom. From this it is evident that the physiographic study of the ocean is broadly interrelated with the study of the land and air. The science of the study of the ocean is called oceanography; and, as in the case of meteorology, while the physiographer must understand the principles, his concern is far less with the science of oceanography than with the application of its principles to an understanding of their influence on life.

Lands. There is a conflict of forces at the present time operating to modify the forms of the lands which themselves so greatly influence life. On the one hand, contraction of the interior of the earth is causing changes in the level of the crust as a result of which continents are raised and ocean bottoms depressed, while mountain chains, volcanoes, plateaus, and plains are being made. On the other hand, opposing forces are at work on the land removing the rocks that lie above the sea level and dragging the fragments into the sea. The weather disintegrates the rocks; the rains, rivers, and winds remove the fragments. Glaciers occasionally aid in this erosion, and the seacoast is the seat of further important work of this kind. The result of the opposing forces of elevation and destruction has been to produce a very complex land surface, and it is one of the most important provinces of physiography to understand this land surface and to point out its effect on life. For this phase of physiography the name "geomorphology" has been proposed. It is intimately related to geology and makes use of geological principles. It is by some considered as a branch of geology, i.e., the geology of the present.

Many of the principles relating to the physiography of the lands are stated under other topics. (See RIVER; LAKE; MOUNTAIN; ETC.) In this place only the scope of the subject will be indicated. The simplest land form is the plain (q.v.), the most extensive and perfect plains being on the sea bottom. They may be classified as constructional and destructional—the former being represented by elevated sea-bottom plains, lake-bottom plains, delta plains, flood plains, etc., the latter by plains of marine denudation, plains caused by lateral erosion of rivers, etc. In the beginning their surfaces are level, they permit the ready spread of animals and plants, and, if the climate favors, they are usually well suited to occupation by man. If newly formed, or young, the surface may be so level that water stands on it as lakes or swamps; but with increasing age the surface is drained, streams cut valleys, the flat-topped divides are narrowed, and the lakes and swamps are destroyed. In the development of these stream valleys, if the plain stands high enough above sea level, or base level, the rapid cutting along

the channels permits the development of deep, steep-sided valleys. In these young valleys the vigorously working streams flow with rapid slope, and with occasional falls where hard layers are encountered. If the land is high above base level, i.e., if it is a plateau, the young streams may so trench the land that travel across country is prohibited by the deep cañons. In such cases the interstream areas only are habitable and are chosen for roads and railways. With time the valleys broaden, the slopes become more gentle, and both the valley bottoms and sides invite settlement. Such a land surface is mature and is well illustrated by the Mississippi valley. There are few if any falls, the rivers are navigable, and they are bordered by flood plains—waste from the land along the course which the river is unable to bear to the sea over its gentle lower slope.

The Alps as a barrier to the spread of life and as a refuge from invasion stand as rugged mountains reaching above the snow line. Their ruggedness is due to their youth and to the fact that denudation, working high above base level, on rocks of very different degrees of hardness, has been able to work rapidly and scar and carve the mountains profoundly. With greater age mountain peaks and ridges are lowered, the valleys are broadened, and the rivers slowly shift position, eating their way backward at the headwaters, robbing weaker opponents of drainage area, and pushing their way across ridge after ridge, as in the Appalachians. The importance of the river gaps to transportation and the influence of mountains on occupation are observable throughout the world.

Rising land gives a straight coast, as along western South America; sinking forms an irregular coast, with many islands, peninsulas, harbors, and straits, as in the northeastern United States. A shelving coast of soft materials which has recently assumed its position is skirted by sand bars, like the coast south of New York, while a young coast of hard rock has bold headlands, with beaches in the bays. Here, again, are innumerable opportunities to study land forms in order to understand their cause and point out their influence on life.

The physiography of the lands investigates islands, peninsulas, capes, plains, plateaus, and valleys, it studies their differences in form; it distinguishes between the different kinds of hills, cliffs, talus slopes, etc. In fact, it studies all land features, and in all cases it is concerned with the form, its cause, its relation to other land forms, and its effects on life. It shows how in their conflict the movements of the crust and the operation of the agents of denudation make land forms by constructional and by destructional processes. It shows that there is a constant building up of land forms by both the internal forces of elevation and the external forces of denudation and that there is constant tearing down by the forces of denudation. It is the province of physiography to trace the operation of these processes, both to see how they modify the lands and to discover the influences of these modifications on life. See GEOGRAPHY; GEOLOGY.

Bibliography. N. S. Shaler, *Nature and Man in America* (New York, 1891); id., *Sea and Land* (ib., 1894); *Physiography of the United States*, published by the National Geographic Society (10 parts, ib., 1896); R. S. Tarr, *Physical Geography of New York State* (ib., 1901);

H. J. Mackinder, *Britain and the British Seas* (ib., 1902); T. H. Huxley, *Physiography* (ib., 1904); R. S. Tarr, *New Physical Geography* (ib., 1904); Eduard Suess, *Face of the Earth*, translated by H. B. C. Sollas (Oxford, 1904-09); R. D. Salisbury, *Physiography* (New York, 1908); James Geikie, *Earth Sculpture* (London, 1909); N. S. Shaler, *Outlines of the Earth's Surface: A Popular Study in Physiography* (New York, 1910); E. S. Grew, *Growth of a Planet* (ib., 1911); Isaiah Bowman, *Forest Physiography* (ib., 1911); R. S. Tarr, *College Physiography* (ib., 1914); Philip Lake, *Physical Geography* (ib., 1915).

PHYSIOLOGICAL SELECTION. A theoretical explanation proposed by Romanes of the evolution of species on the principle of the prevention of intercrossing. Hence Romanes also referred to the assumed law as that of the "segregation of the fit." He was led to his generalization by consideration of the facts of sterility between species and of fertility between varieties and races. Basing upon observation the postulate that the reproductive system was the most susceptible to change of any part of an animal's organization, he argued that in that system would often (perhaps more often than in any other) arise independent variations in individuals. If these were of such a character as to tend towards sterility between them and parent forms, they would tend to separate the variety from the species and a new species would evolve. Romanes concluded that the principle of sterility between species was essential to the separate existence of species.

PHYSIOLOGY (Lat. *physiologia*, from Gk. *φυσιολογία*, natural philosophy, from *φυσιολόγος*, *physiologos*, discoursing on nature, natural philosopher, from *φύσις*, *physis*, nature + *λόγος*, *logos*, word, account, ratio, from *λέγειν*, *legein*, to say). Under the term "physiology," when used in its widest sense, we include all that is known of the properties of living matter. Following the great line of demarcation of living things into animals and plants, we have an animal physiology and a plant physiology. The two subjects, while closely related, are sufficiently different to be considered as separate sciences and to require specialists of different training for their study. In animal physiology we have to deal especially with the properties of animal protoplasm, and although the fundamental properties of this material are believed to be much the same in all animals, yet for each animal or group of animals there are minor distinctions which are due in part to fundamental differences in structure and in part to the variety in the physiological mechanisms developed in different animals. In what follows an attempt will be made to present briefly an outline of the important facts and principles of human physiology, but it should be remembered that the body of facts included under this designation has been obtained in many, if not in most, cases by direct study and experiment upon lower forms of life, not only upon the mammals most closely related in structure to man, but also upon the simplest organisms which for one reason or another have offered especial opportunities for study.

It is convenient to consider the physiology of the human body under two general heads, viz., the properties of the tissues and the properties or functions of the organs and mechanisms. The human body, like that of other animals,

starts as a single cell, the fertilized ovum. During the progress of development this cell multiplies to form an infinite number of cells which gradually become distinguished in structure and segregated into groups that are known as tissues. Each tissue is characterized by its appearance, as seen by the eye or with the aid of a microscope, and also by known differences in chemical composition and reaction. We distinguish in the human body the muscular tissue, the nervous tissue, the epithelial tissue, the gland or secreting tissue, the blood, the connective or supporting tissue, the lymphatic tissue, the tissue forming the red blood corpuscles, and so on. Each tissue is different not only in structure but in its properties. Along with the differentiation in form there is a specialization in function. Without attempting to describe their microscopic characteristics, a word or two may be said of the more important physiological properties of some of these tissues.

Muscular Tissue. In man, as in the other vertebrates, we distinguish three kinds of muscular tissue: (1) the cross-striated or voluntary muscle which forms the musculature of the body by means of which our voluntary movements are made; (2) the heart muscle, composing the walls of the heart; and (3) the plain or unstriated muscle which is found in the walls of the hollow viscera, such as the alimentary canal, the blood vessels, the uterus, the bladder, etc. The common characteristic of these three tissues is the property of contracting. While this property may occur in other tissues, it reaches its greatest development in the muscles. In cross-striated muscles the contraction is always started by a stimulus received through the nerves and originated usually in the brain by an act of the will. The contraction is very rapid. A single stimulus gives a single or simple contraction that occupies less than one-tenth of a second. All of our ordinary voluntary contractions are, however, compound or tetanic, i.e., they are composed of a rapid series of simple contractions fused together more or less completely. The rapid series of contractions is due to a series of stimuli or nerve impulses received from the brain through the nerve fibres connecting it with the muscle. In every voluntary movement, therefore, whether short or prolonged, we must imagine to ourselves a series of changes in the nerve cells of the brain, which are propagated along the connecting nerve fibres to the muscle or muscles and there set up a series of contractions so rapid that they become fused into a long-lasting contraction or movement.

Plain muscle is characterized by the slowness of its contractions. The tissue as found in different parts of the body varies somewhat in this respect, but in all cases its contractions are very much slower than in the cross-striated muscle. The plain muscle, moreover, is not under voluntary control; we are not conscious of the movements of the stomach, the blood vessels, etc. The contractions of these organs are brought about by stimuli conveyed to the muscle through the so-called sympathetic nervous system. The slow and prolonged contractions of plain muscle explain the gentle, long-continued movements of the viscera such as occur in the action of the stomach and intestines in propelling food along their length. Heart muscle is intermediate in structure between the plain and the cross-striated varieties. Its contractions are also intermediate in duration, but approach closer to the quick

movement of the striped muscle. The predominant characteristic of heart muscle, however, is its property of making spontaneous rhythmic contractions which are due, not to external stimuli received through the nervous system, but to processes arising within itself. To this property is due the rhythmic beat of the heart.

Nervous Tissue. The nervous tissue is found in the brain, the spinal cord, the nerve ganglia of the sympathetic system, and the peripheral nerves or nerve trunks distributed throughout the body. The nerve tissue consists of nerve cells and their processes. The body of the cell lies in the nerve centres, i.e., the brain, the spinal cord, and the ganglia—and the typical cell has two kinds of processes—one comparatively short and much branched, known as the dendrites or dendritic processes; the other but little branched and in some cases very long, as much as 2 or 3 feet. This latter branch is known as the axi-cylinder process, it may pass out of the nerve centres to be distributed to the other tissues forming the essential part of what we call nerve fibres. It is important, therefore, to bear in mind that nerve fibres are essentially long processes from nerve cells and form the mechanism by which the nerve centres are connected with and influence the activity of the peripheral tissues. Physiologically the important function of a nerve fibre is to conduct a change or process known as the nerve impulse. This impulse travels along the fibre at a rate of about 100 feet per second. The nerve fibres fall into two great groups—those that convey impulses from the peripheral tissues to the nerve centres, and those that convey impulses from the centres towards the periphery. The former group compose the afferent or sensory fibres, the latter name being used because in many cases the impulses finally reach the brain and give rise to conscious sensations of various kinds. In many cases, however, the impulses conveyed to the nerve centres by the afferent fibres cause no change in consciousness, but manifest themselves by what we call reflex effects, as, e.g., in the movements of the intestines, the blood vessels, or the heart. The group of fibres that carry their impulses outward from the centre to the peripheral tissues compose the efferent or motor fibres. If these fibres end in muscles, the effect of their impulses is the production of a muscular contraction; if they end in a gland, they cause a secretion, the nature of the resulting action depending on the kind of tissue with which the nerve fibre is connected. It should be stated that there is no known difference in structure between afferent and efferent nerve fibres. Each, like a telegraph wire, can conduct an impulse in either direction. But just as a telegraph wire with a sending apparatus at one end and a receiver at the other is arranged to conduct messages only in one direction, so the afferent and efferent nerve fibres, by the peculiarities of their end connections, are arranged so that normally they can convey effective impulses in only one direction. What we call a nerve or a nerve trunk consists of many hundreds or thousands of nerve fibres belonging usually to both the afferent and the efferent group. Though combined in one bundle, each fibre is physiologically independent and may act alone or in combination with others in the same trunk. In a muscle, on the contrary, the hundreds or thousands of muscular fibres of which it is composed act

usually as a unit, all contracting together when the muscle is in action.

Reflex Actions. A large part of the beautiful adaptation and coördination of the different parts of our bodies is effected by the reflex activities of the nervous system entirely outside our conscious knowledge. The way in which these reflexes are produced is illustrated best by the simple reflex movements that can be obtained from a headless frog. If in such an animal, with its spinal cord intact, one of the toes is gently pinched, the leg will at once be drawn in towards the body. If the skin is stimulated by bits of paper moistened with dilute acetic acid, the leg of the corresponding side will be raised and the piece of paper will be wiped off by a neat movement involving the coördinate activity of a number of muscles. What happens in these cases is that the stimulus applied to the skin irritates the sensory nerve fibres and sends in a stream of nerve impulses to the spinal cord. These impulses are conveyed to the dendrites of certain motor nerve cells and arouse in them fresh impulses which are conducted outward through the efferent nerve fibres to the muscles. The original stimulus, or, more accurately, the nerve impulses to which it gives origin, are thus, as it were, reflected in the nerve centres and sent to the peripheral tissues, whence the name of reflex action. Every such reflex involves the activity of at least two groups of nerve cells, one connected with the sensory fibres stimulated and one connected with the efferent fibres going to the muscles. Such reflexes may occur in all parts of the spinal cord and brain. A common reflex in ourselves, e.g., is the winking of the eye when its sensory surfaces are touched. As a rule, we limit the term "reflex action" to those cases in which the element of consciousness is not involved. As a matter of fact, however, all of our conscious processes and mental activities are effected by a similar action of one nerve cell or unit on another, the mechanism in action being essentially similar to, although more complex than, the simple reflexes of the spinal cord. In a mammal as well as in a frog it can be shown that if a part of the spinal cord is severed from its connections with the brain, under such conditions that death does not result at once, the part of the cord below the injury will suffice to effect complex movements upon appropriate stimulation of the skin. To the uninformed such movements usually suggest consciousness, but the evidence of physiology proves conclusively that they are entirely unconscious reflexes.

It should be added that the outgoing impulse in reflex stimulation of the cord or brain may proceed through nerve fibres connected with other tissues such as the heart muscle, the plain muscle of the viscera or the glands, and the reflex effect, instead of exhibiting itself as a movement of the limbs, may take the form of a secretion, of a change in the heart beat, or of a constriction or dilatation of the blood vessels. Owing to the complexity of the connections among the numerous nerve cells in the spinal cord and brain, it is evident that reflex effects may be widespread and very intricate. Certain definite paths or connections are inherited or become acquired during life from repeated use, so that the passage of a sensory nerve impulse that reaches the central nervous system is not haphazard, but for the most part along predetermined paths. The wonderful instincts of the

lower animals may be regarded as complicated reflexes, and the unconscious regulation of the different parts of our body, especially the activity of the internal organs or viscera, is controlled in this way by the nervous system.

Circulatory Mechanism. The anatomical mechanism for the circulation of the blood and lymph consists of the heart, the blood vessels, and the lymph vessels. With regard to the blood we have the central fact that the powerful musculature of the heart serves as a force pump driving the blood out from the ventricles through the circuit of the blood vessels and back to the heart. The system of arteries branching from the heart resembles a tree with its central trunk and its vast number of branches of different sizes. As one goes outward from the heart towards the periphery, the arteries distributed to each organ become smaller and smaller until they end in minute capillaries. The combined area of these branches increases, however, towards the periphery, so that the sum of the areas of all the capillaries arising from the aorta is several hundred times as great as that of the aorta itself, just as the combined diameters of all of the twigs of a tree would much exceed that of the trunk. The quantity of blood being practically the same at all times, it becomes distributed as it goes out from the heart over a wider and wider area, or, to use a convenient figure, flows through a wider and wider bed. As a result of this fact the velocity of the blood flow becomes smaller as we approach the capillaries. While in the aorta the blood may flow with a velocity of 300 millimeters per second, in the capillaries the velocity becomes reduced to $\frac{1}{2}$ millimeter. In the venous system the same general fact holds true. The capillaries unite into larger veins, and these into still larger ones, until finally all of the blood in the aortic system is collected into two large veins, the superior and the inferior vena cava, which open into the auricles. As a consequence the blood, as it flows back to the heart, passes through a path that becomes narrower and narrower, and its velocity increases proportionately. With regard to the velocity of the blood flow, therefore, we can state that it is greatest in the large arteries and veins and least in the capillaries.

In the arteries, moreover, the blood is under a much greater pressure than in the capillaries and veins. From a cut artery the blood spurts to some distance, while from a cut vein the blood flows out quickly, but with little force. The cause of this difference is easily understood. In flowing through the vessels the blood encounters considerable resistance. Naturally this resistance is greatest in the capillaries and in the small arteries and veins communicating with them. On account of the great resistance in the capillary region, known technically as the peripheral resistance, the blood is dammed up, retarded on the arterial side, stretching the elastic walls of the arteries and putting the blood under a considerable tension. In the capillaries the pressure of the blood is much less, and in the veins it becomes smaller and smaller as we approach the heart. Physiologically the most important part of the blood circuit is in the capillaries. While flowing through these thin-walled and very minute vessels, the blood fulfills its function of nourishing the tissues. At this point the blood, while still under some pressure, is flowing at its slowest rate, and the liquid

part of it, the blood plasma, transudes through the thin walls and comes into direct contact with the tissues, thus forming the tissue lymph. The oxygen carried by the red corpuscles of the blood is liberated in the capillaries and diffuses from the blood to the tissues, being transported to the latter while held in solution in the lymph. The lymph gives up its food materials and oxygen to the tissue cells and at the same time receives from them the waste products and carbon dioxide formed during their nutritive activity. The lymph is prevented from accumulating in the tissues by the fact that it is continually drained off by the system of lymphatic vessels. These vessels form a system parallel in course and structure to that of the veins. They begin in the tissues by small capillaries which unite to larger and larger vessels, forming eventually two main trunks that open into the veins of the neck. By this arrangement the excess of lymph is continually drained off and returned to the blood. The means by which the supply of lymph is regulated forms one of the most interesting and difficult subjects of study in modern physiology.

The heart and blood vessels are not a fixed and rigid system. On the contrary they are supplied with nerves through which the beat of the heart and the capacity and resistance of the blood vessels may be reflexly adapted to the different conditions of the body as a whole, or the individual needs of its separate parts. The heart receives two sets of nerve fibres: one, the inhibitory fibres, are capable of slowing the heart beat; the other, the accelerative fibres, quicken the rate. The small arteries, on the other hand, receive also two sets of nerve fibres: one, the vasoconstrictors, causes a diminution in size of the blood vessels, while the other, the vasodilators, brings about an increase in size. The numerous conditions under which these regulating nerve fibres act are too complex to be described here. The mechanism is so adjusted as to control automatically the supply of blood to different organs under varying conditions of rest and activity.

Respiratory Mechanism. In mammals like ourselves the chief organ of external respiration is the lung. When the inspiratory muscles are contracted, the chest is enlarged and air flows into the lungs. When the expiratory muscles are contracted, the chest is diminished in size and air is forced out of the lungs. In ordinary respiration the expiratory act is entirely passive; the chest, expanded by the action of the inspiratory muscles, sinks back into its normal position when these muscles cease to act. In forced breathing, however, the expiratory muscles come into action. By means of these respiratory movements the air in the lungs is continually renewed, the supply of oxygen is maintained, and the carbon dioxide is removed. The oxygen contained in the air sacs of the lungs diffuses through their thin walls, and, coming into contact with the blood, it unites chemically with the coloring matter of the red corpuscles, the hæmoglobin. In this combination it is carried to the heart and thence distributed over the body through the various arteries. When the blood reaches the capillaries, the compound of hæmoglobin and oxygen is broken or dissociated by the physical conditions there prevailing, while the liberated oxygen passes into solution in the blood plasma and lymph and is thus conveyed to the tissues. On the other

hand, the general nutritive change or metabolism of the tissues results in the formation among other things of carbon dioxide. This substance is a waste product, and if it accumulates in the tissues brings on a suppression or perversion of the normal nutritive processes. Under normal conditions, however, it is rapidly removed by the lymph and blood. As the oxygen passes from the blood to the tissues by diffusion through the thin-walled capillaries, so the carbon dioxide, as rapidly as it is formed, streams in the opposite direction from tissues to blood. Each gas follows the physical law of diffusion from a point of greater to one of less tension. Within the blood the carbon dioxide is held mainly in chemical combination—partly with the proteids of the blood plasma, partly with the proteids of the blood corpuscles. When the blood reaches the lungs, this loose chemical union breaks down, the carbon dioxide is liberated and diffuses into the air sacs of the lungs, whence it is given off in the expired air. The process of respiration, therefore, may be divided into two parts, external and internal respiration. Under the former term we include all the processes involved in the movement of air into and out of the lungs, and the exchange of oxygen and carbon dioxide between the blood and the air in the lungs. By internal respiration we mean the exchange of oxygen and carbon dioxide between the tissues and the blood as well as the processes of nutrition by means of which the oxygen is used and the carbon dioxide produced. What we call arterial blood differs from venous blood in that it contains more oxygen and less carbon dioxide, and to this difference in the gaseous contents is due also the well-known variation in color—arterial blood having a scarlet tint, while the venous blood is purplish or crimson. The machinery for the movements of respiration, i.e., the respiratory muscles, is under the control of the central nervous system. These muscles may be influenced within certain limits by direct voluntary effort; but a far more important factor is their unconscious or reflex regulation exerted through the respiratory nerve cells or nerve centres found in the medulla oblongata. By the activity of this centre the respiratory movements are kept continually in play and the extent of the respirations is adjusted to the needs of the body.

Digestion and Nutrition. The living matter of the animal body is characterized, as compared with plant protoplasm, by its limited powers of assimilation. While the latter can construct living matter from comparatively simple inorganic material, such as carbon dioxide, water, and nitrogen-containing salts, the former requires food in the more complex form of organic material. Since in the last analysis this organic food is derived from the plant kingdom, it may be said that the maintenance of animal life is possible only through the synthetic activity of plant protoplasm. All of our varied foods are found upon analysis to be composed of essentially the same materials united in different proportions. These constituent materials of our foods are known as foodstuffs and are usually classified as *proteids*, *fats*, *carbohydrates*, *water*, and *salts*. Of these substances, the water, inorganic salts, and proteids are absolutely essential. The two former are necessary to the composition and reactions of the living tissues, but they do not directly furnish any energy to the body. The requisite amount of water is

controlled by the sensation of thirst, and the proper proportions of the inorganic salts are provided in our foods without the necessity of any conscious selection on our part, except perhaps in the case of sodium chloride. Proteid foods have a different value. They are complex nitrogen-containing compounds, which in the body are destroyed and reduced to much simpler substances, viz., carbon dioxide, water, and urea. This destruction of proteid is essentially an oxidation, and as much heat is given off in the process as would be liberated outside the body by burning proteid to the same end products. Proteids are an absolutely necessary constituent of food, because they contain nitrogen in a form capable of being used in the construction of living matter. Fats and carbohydrates, since they contain no nitrogen, cannot be used alone in the synthesis of protoplasm. They are nevertheless valuable foods, since they are readily destroyed or burned in the body with the liberation of energy in the form of heat or muscular work. In a normal diet proteids, fats, and carbohydrates are usually combined in certain proportions, and experience as well as direct physiological experiments show that within limits the fats and the carbohydrates may be interchanged, and furthermore the greater the amount of these two substances used the less will be the amount of proteid required; or, as we say in physiology, fats and carbohydrates are "proteid spacers."

The nutritive history of these three energy-yielding foods may be summarized briefly as follows: The proteids in whatever form they may be taken are digested partly in the stomach by the action of the gastric juice and partly in the intestines by the action of the pancreatic juice. By the act of digestion the food proteids are converted into simpler and more soluble forms, known as peptones and proteoses, which are then absorbed into the blood and carried to the various tissues. Here they are utilized in part to form protoplasm, either to replace that broken down in metabolism or to supply material for growth. But much the larger part of the proteid is simply destroyed in the tissues with the transformation of some of its chemical energy into a corresponding amount of heat. The fats are prepared for digestion in the stomach, but undergo the important change that fits them for absorption after they are brought into contact with the pancreatic juice in the small intestine. After absorption they are found in the blood and lymph for a time, but soon pass into the tissues. Here they may be deposited as part of our normal store of body fat, but with the usual diet of adult life they are supposed to be completely oxidized. It is known from experiments that 1 gram of fat burned outside or inside the body yields as much heat as 2.2 grams of proteid. The carbohydrates include the starches and the sugars, which from a nutritive standpoint have the same value. The starches form the bulk of our diet, and they are digested partly in the mouth by the action of the saliva, but mainly in the small intestine by the action of the pancreatic secretion. Under the influence of these secretions the starches are converted into a form of sugar, which is then absorbed into the blood. As the blood from the intestines passes through the liver, this absorbed sugar is removed and again converted into a form of starch known as glycogen, which is deposited or stored in the liver cells. From time to time the glycogen is recon-

verted to sugar and given off to the blood. The regulating mechanism controlling this production and conversion of glycogen is so adjusted that under the normal conditions of life the blood always contains a nearly constant amount of sugar. Sugar, therefore, is the final form in which all of our carbohydrate food is brought to the tissues, and under the influence of the living matter it is eventually oxidized to carbon dioxide and water. In the long run, therefore, the final fate of our food is to be burned and furnish energy in the form of heat, muscular work, etc. The continual consumption of food is necessary to maintain the body temperature, and in the body we have very complex regulating mechanisms which control the loss of heat and to a certain extent its production, with the normal result that the temperature of the body remains nearly constant under all the varying conditions of life. It has been shown with scientific accuracy that all the detectible energy given off from the body is derived directly from the food consumed. The energy value of any food can therefore be determined by ascertaining the amount of heat produced by burning it, or more conveniently by ascertaining the heat value of proteids, fats, and carbohydrates, and then analyzing the food to determine how much of these three foodstuffs is contained in it.

Central Nervous System. Some statements regarding the structure of the nervous system will be found in the beginning of this article. (See also NERVOUS SYSTEM AND BRAIN.) At the base of the brain immediately adjoining the spinal cord we have the medulla oblongata. In this part of the brain are found certain important collections of nerve cells which control the movements of respiration, of the heart, and of the blood vessels, their activity being entirely unconscious and under the influence of reflex stimulation. Collections of nerve cells connected with and regulating the action of physiological mechanisms are known as nerve centres, and in the medulla we recognize the existence of the three centres mentioned and designate them as the respiratory centre, the cardio-inhibitory centre, and the vasomotor centre. They and other similar centres regulate the activity of the visceral organs, whose functions are discharged for the most part without our conscious knowledge or control. Injury to the medulla or severance of its connections with the spinal cord is fatal at once, owing to the destruction of the connections of the respiratory centre with the respiratory muscles and the consequent inability to breathe. In the cerebellum we have an organ which seems to control the coördinated activity of the voluntary muscles. Extensive injury to the cerebellum, while not accompanied by actual paralysis, renders the animal incapable of executing orderly movements. If the animal survives the injury, the ability to make coördinated movements may be recovered more or less completely, but some awkwardness and muscular weakness persist as permanent results. In the nerve cells of the cerebral hemispheres we have the seat of the conscious sensations and of all the so-called psychic activities. Modern physiology has shown that different parts of the cerebral hemispheres have different functions. The optic nerve fibres end eventually in the occipital lobes, and here our conscious sensations of vision are mediated. A similar arrangement prevails for the other senses. In the cortex

of gray matter covering the cerebral hemispheres there are in fact certain sense areas each of which mediates a different kind of consciousness. Other areas are connected with the various muscles of the body and form the centres through which our voluntary movements are executed, while in still other regions we have areas in which are stored the memories of past experiences and in which the factors of sensation are organized into the complex associations that characterize our mental life. Injuries to the brain may therefore be followed by quite different results according to the region involved. There may be a paralysis of this or that group of muscles, a loss of this or that primary sensation, or a disturbance or perversion of this or that group of memory associations. The so-called aphasias form noteworthy illustrations of these facts. Injury to certain limited areas of the brain may result in a partial or complete loss of the power of speech, or of the ability to understand either written or spoken language without any interference with vision or hearing. When defects of this character exist, it is possible to locate the probable seat of the lesion, and not infrequently this knowledge has been made the basis of successful surgical operations.

History of Physiology. The history of physiology is coextensive with that of medicine. Its relatively slow advancement through many centuries was closely associated with the growth of anatomical, chemical, and physical knowledge. In modern times, however, dating perhaps from the first part of the nineteenth century, physiology has become an independent science with a technique peculiarly its own, yet adopting more and more the exact methods that have arisen in the sciences of physics and chemistry. This development of physiology has been especially marked since investigators abandoned the idea of a special vital force controlling the phenomena of life and set themselves to the task of explaining the properties of living matter in terms of the forms of energy recognized as responsible for the phenomena of inanimate nature. The great facts in physiology, as in other subjects, have been discovered in a few cases only by the genius of individual workers. In most instances they have developed gradually as the result of the combined labors of many investigators, so that a history of the growth of the fundamental principles of modern physiology involves a discussion of the progress of the natural sciences in general. Every important advance in physics and chemistry has influenced and will continue to influence the development of physiological knowledge. Some of the significant discoveries that belong especially to physiology and that can be traced more or less exactly to a definite period and individual observers are as follows: the circulation of the blood (Harvey, 1616-28); the existence of the lymphatic system of vessels (Aselli, 1622); the microscopic structure of the lungs, capillaries, glands, and other tissues (Malpighi, 1660-90); the discovery of the mammalian spermatozoon (Leeuwenhoek, 1674); the method of direct measurement of blood pressure (Hales, 1733); the digestive action of gastric juice (Réaumur, 1752); the independent irritability of muscle (Haller, 1757); the discovery of oxygen and its functions in respiration (Lavoisier, 1775); the distinction between motor and sensory nerve fibres (Bell and Magendie, 1811-22); the experiments on digestion (Tiedemann, 1826-46); the discovery of the mam-

malian ovum (Von Baer, 1828-34); the true nature of the secretions of glands (Johannes Müller, 1830); the existence of pepsin (Schwann, 1836); the nature of reflex actions (Marshall Hall, 1837); the electrical phenomena of muscle and nerve (Du Bois-Reymond, 1843); the existence of inhibition and inhibitory nerve fibres (Weber, 1845); the conservation of energy (Helmholtz, 1847); the introduction of the graphic method in physiological experimentation (Ludwig, 1847); the existence of secretory nerve fibres (Ludwig, 1851); the existence of vasomotor nerve fibres (Bernard, 1851); the existence and functions of glycogen (Bernard, 1857); the laws of nutrition (Bischoff and Voit, 1860) and of respiration (Pflüger, 1862); the function of hemoglobin in respiration (Hoppe-Seyler and Stokes, 1862-64); the localization of function in the cerebrum (Fritsch and Hitzig, 1870); the demonstration of the indefatigability of the nerve (Bowditch, 1890); the establishment of the fact of internal secretions (Brown-Séquard, 1891, and Sajous, 1903); the study of metabolism (Von Noorden, 1892-95); the action of the digestive glands (Pavloff, 1898). Twentieth-century physiology is closely linked with pathology, and their mutual progress is marked by the patient, world-wide coöperation of thousands of students rather than the isolated though brilliant discoveries of individuals. The subject covers a wide field and receives due notice in this work under such titles as BLOOD; BLOOD PRESSURE; IMMUNITY; NYSTAGMUS; OPSONINS; SECRETIONS, INTERNAL; ETC.

Bibliography. General: J. C. Dalton, *Treatise on Human Physiology* (7th ed., Philadelphia, 1882); E. A. Schäfer, *Text-Book of Physiology* (2 vols., New York, 1898-1900); Sir Michael Foster, *Text Book of Physiology* (7th ed., ib., 1904); Jacques Loeb, *Studies in General Physiology* (Chicago, 1905); G. A. Piersol, *Text-Book of Normal Histology* (8th ed., Philadelphia, 1910); A. P. Beddard and others, *Practical Physiology* (3d ed., New York, 1910); H. W. Lyle, *Manual of Physiology* (Oxford, 1911); Cole, *Practical Physiological Chemistry* (4th ed., St. Louis, 1914); Hammersten and Heden, *Text-Book of Physiological Chemistry* (7th ed., New York, 1914); W. S. Kirkes, *Handbook of Physiology*, revised by C. W. Greene (8th Am. ed., ib., 1914); G. N. Stewart, *Manual of Physiology* (7th ed., ib., 1914); W. B. Cannon, *Bodily Changes in Pain, Hunger, Fear, and Rage* (ib., 1915); Luigi Luciani, *Human Physiology*, translated by F. A. Welby, vols. i-iii (ib., 1915); W. D. Zoethout, *Laboratory Manual of Physiology* (3d ed., Chicago, 1915). Comparative: Agassiz and Gould, *Outline of Comparative Physiology*, edited and enlarged by Thomas Wright (New York, 1870); Jacques Loeb, *Comparative Physiology of the Brain and Comparative Psychology* (ib., 1900), containing a bibliography; V. L. Kellogg, *Animals and Man* (ib., 1911); J. B. Lamarck, *Zoological Laboratory* (ib., 1914). History: Sir Michael Foster, *Lectures on the History of Physiology* (ib., 1907); J. L. Lister, *Collected Papers* (2 vols., Oxford, 1909).

PHYSIOLOGY OF PLANTS. History. Up to the close of the seventeenth century nothing was known of the physiology of plants beyond the scattered impressions derived from the practical cultivation of plants in fields and gardens. Inasmuch as the physiology of animals was better known, the first study of the actions of plants was an endeavor to identify plant func-

tions with those of animals. As the functions of animals were only superficially known, this attempted identification led oftentimes to most egregious errors. But as the nature of animal functions became better known the essential identity of the processes in both sorts of living beings became more evident. At first the study of physiology was scarcely more than an enumeration of plant activities and their comparison with those of animals. Later, however, attempts were made to investigate the causes and conditions of the functions. For this a knowledge of anatomy was recognized as of prime importance. Deeper insight into physiology, however, demanded knowledge of physics and chemistry; and it was only when these two sciences underwent their profound transformation and extension that explanations of plant phenomena began to be possible. Among the earliest investigations after the revival of learning were those made in Italy by Malpighi on the movement of sap and those of Ray on the influence of light upon the colors of plants. About the same time, in Germany, Camerarius proved the necessity of pollen for the formation of fertile seeds.

Early in the eighteenth century Hales published his studies on the movement of sap and the evaporation of water from the leaves. Later in the eighteenth century came the investigations of Koelreuter, who added to the knowledge of sexuality in plants by his experiments on hybridization. It was in connection with these experiments that the relations of insects to pollination were first pointed out. Later (1793) these interesting relations were set forth at length by Christian Konrad Sprengel, whose famous "Das entdeckte Geheimnis der Natur" was scarcely appreciated until the contributions of Darwin had opened the eyes and understanding of naturalists to Sprengel's extraordinary work. About the same time Ingenhous showed that the green parts of plants when illuminated absorb carbon dioxide and eliminate oxygen, thus deriving the carbon which they need from the atmosphere. He also showed that the living parts of plants absorb oxygen, whether illuminated or not, and evolve carbon dioxide, thus establishing the fundamental facts of nutrition and respiration. This work was further confirmed by Senebier, who demonstrated that the decomposition of carbon dioxide takes place only in green organs. He also studied the influence of light upon the growth and green color of plants. By the beginning of the nineteenth century Nicolas Théodore de Saussure had shown that plants not only fix carbon from carbon dioxide, but also use the elements of water, which, with the mineral salts, are a necessary part of the food materials. Between 1822 and 1832 De Saussure and Goeppert established the connection between the respiration of plants and the development of heat in their bodies. Through the influence of Liebig, about the middle of the century, Ingenhous's clear exposition of the respiration of plants, which had been fairly established, was discarded, to be reinstated in confidence only after 1860 by the father of modern vegetable physiology, Julius von Sachs. Yet Liebig's valuable work in connection with the chemistry of foods and food materials of plants and Boussingault's investigations in France, especially in relating the known facts to the empirical processes of agriculture, were of great service to both cultivators

and physiologists. The year 1860 marks the rise of modern physiology, as indeed it does the rise of modern biology, many cooperating causes, the most notable of which was the publication of Darwin's *Origin of Species*, furnishing the impulse to renewed investigation.

Scope. As a science plant physiology concerns itself with every inquiry relating to the functions and behavior of living plants. Certain aspects of physiology, viz., the relation of living plants to the environment, physical (including soil, water supply, temperature, etc.) and biological (i.e., other plants and animals), have recently been separated from physiology proper and named ecology (q.v.). Physiology proper restricts itself to the activities of the individual plant. Its study demands a previous knowledge of the anatomy (q.v.) and histology (q.v.) of plants, since familiarity with plant mechanism must precede the knowledge of plant function.

The functions of plants may be divided for convenience into certain groups. *First*, processes connected with the absorption of materials by the plant from the surrounding medium. Everything which enters the plant body must do so in solution. The plant depends, therefore, fundamentally upon water, which, with an infinite variety of solutes, both solid and gaseous, it absorbs. (See ABSORPTION.) *Second*, processes by which materials escape from the plant body. Gases, especially carbon dioxide and oxygen, are evolved (see AERATION; OSMOSIS); a great variety of materials are eliminated from the plant body by various processes of secretion (q.v.); and water is evaporated in great quantity by the surfaces of land plants. (See TRANSPIRATION.) *Third*, processes by which water and foods are moved about from the points of absorption or manufacture to the points of use, storage, or loss. But in spite of the fact that the movement of water was almost the first subject that attracted the attention of observers, no satisfactory explanation has yet been devised. (See CONDUCTION.) *Fourth*, processes of nutrition. Carbohydrate foods are made only by green plants under the influence of light, a power which is of the utmost importance, since the commercial supply of food and energy depends at present almost wholly upon green plants. The making of carbohydrates is fully described in the article PHOTOSYNTHESIS. (See CHLOROPHYLL; CHLOROPLAST.) All plants, however, make protein foods, when the necessary supply of carbohydrates, nitrates, and salts is furnished. Protein synthesis is discussed in the article FOOD IN PLANTS. When protein foods are at hand, either through manufacture or absorption, they undergo various changes before they become a part of the protoplasm. (For what little is known of these processes, see ASSIMILATION.) *Fifth*, processes concerned with the release of energy in the plant body or adjacent to it, in such a way that the kinetic energy can be applied to such work as the plant must do. For most plants these processes constitute respiration. (See RESPIRATION IN PLANTS.) For a few plants fermentation (q.v.) seems to replace, in part at least, the normal respiration. *Sixth*, processes of repair and growth. One of the important activities of the plant is the formation of new material or the rearrangement of old into new parts. The diverse operations involved in this constitute growth (q.v.). *Seventh*, processes of

perception and response. Every function of the plant is more or less influenced by the changes occurring in its vicinity, whether these be entirely outside of the body or only in adjacent parts. In order to adjust itself to these changes the plant must receive impressions of them, and these impressions must result in appropriate adjustment. The changes in the protoplasm corresponding to changes in the surrounding medium and the chain of effects thus initiated are said to manifest irritability (q.v.). The visible alterations of the rate of growth (q.v.) or in movement (q.v.) are most striking evidences of irritability. See CHEMOTROPISM; GEOTROPISM IN PLANTS; HELIOTROPISM; HYDROTROPISM; MOTOR ORGAN; RHEOTROPISM; STIMULUS; TENDRIL; TRAUMATROPISM.

Bibliography. Vines, *Lectures on the Physiology of Plants* (Cambridge, 1886); Julius Sachs, *Lectures on the Physiology of Plants* (Oxford, 1887); id., *History of Botany, 1530-1860*, English translation by H. E. F. Garnsey (ib., 1890); id., *History of Botany, 1860-1900*, English translation by J. R. Green (ib., 1909); Wilhelm Pfeffer, *Physiology of Plants*, English translation by A. J. Ewart (2d ed., 3 vols., ib., 1899-1905); W. F. Ganong, *Laboratory Course in Plant Physiology* (2d ed., New York, 1908); B. M. Duggar, *Plant Physiology* (ib., 1911); J. M. Coulter and others, *Text-Book of Botany for Colleges and Universities* (2 vols., ib., 1911); J. R. Green, *Introduction to Vegetable Physiology* (3d ed., Philadelphia, 1911); K. A. Timirjazev, *Life of the Plant*, English translation by Chéréméteff (New York, 1912); W. F. Ganong, *The Living Plant* (ib., 1913); Ludwig Jost, *Lectures on Plant Physiology*, English translation by R. J. H. Gibson (2d ed., Oxford, 1914). See BOTANY.

PHY'SODON (Neo-Lat., from Gk. φύσα, *physa*, bellows, breath, bubble + ὀδούς, *odous*, tooth). An extinct sperm whale known by its skull, found in the Miocene formations of Patagonia. It differed from the modern sperm whale in having enamel-capped teeth in its upper jaws. See CETACEA.

PHY'SOSTIG'MA. See CALABAR BEAN.

PHY'SOSTIG'MINE. See ALKALOIDS.

PHY'TOGEÓ'GRAPHY, or PLANT GEOGRAPHY. This subject concerns itself with the distribution of plants and has to consider both the causes which are at present operative in maintaining the distinctive floras of various lands and the historical changes by which these floras have been evolved. The various plant communities of allied forms due to climate and other physical factors, and the great plant families together with the areas they occupy, are discussed under DISTRIBUTION OF PLANTS (q.v.). There remains, however, that part of the subject which deals with the division of the earth's surface into phytogeographic regions, each with a distinctive flora of its own. Such regions are separated from one another by barrier lines that have retarded the migration of plants and resulted in the segregation of larger or smaller aggregations of species. For the complete understanding of such floras not only are the present conditions of the earth's surface to be considered, but also the development and distribution of plant life during past geological ages. (See PALEOBOTANY.) Barriers of the first rank are either climate or consist of interruptions of the continuity of the land surface by such large bodies of water as oceans; while

barriers of minor importance are to be found in smaller bodies of water, mountain ranges, and the minor elevation of various areas. The most pronounced of all barriers is along the tropic of Cancer, and in it the arid, hot climate of northern Mexico and of the Sahara and Asiatic deserts seems to be the effective factor. South of the tropic of Capricorn similar but less marked arid conditions, together with vast oceanic areas, form almost as effective a check to plant migration. Both encircle the globe in an east-west direction. The great north-south extent of the Atlantic and Pacific oceans provides the remaining natural areas of division for separating the globe into four areas occupied by great floral realms. They are (I) the Boreal, (II) the Paleotropical, (III) the Neotropical, and (IV) the Antarctic, to which may be added the vast extent of the waters in (V) the Oceanic.

I. **The Boreal Realm** is known also as the Arcto-Tertiary, since its flora seems to have descended from an ancient one which during Tertiary times encircled the pole well within the Arctic circle. Subsequent glaciation and postglacial migration have extended the limits of the descendants of this Arctic flora to the present boundaries of the Boreal realm, i.e., over almost all the vast land areas north of the tropic of Cancer. It has been variously divided into regions and provinces by Engler, Drude, and other phytogeographers, but the following main divisions are widely accepted, although at times they appear under other names and are given different rank: (1) the Arctic region, north of the limit of tree growth and lying almost wholly within the Arctic circle. It is sometimes divided into the Ne-arctic and Palearctic subregions, belonging respectively to the Western and Eastern hemispheres; but as many of the species are circumpolar such a division is rather artificial. In fact nothing is more characteristic of the entire region than the wide distribution of species and the absence of endemism (q.v.). Being without trees, the vegetation takes the form of tundras in which lichens, notably the reindeer lichen (*Cladonia rangiferina*), mosses (such as *Polytrichum* and *Sphagnum*), perennial herbs, and shrubs are dominant. Among the last shrubby willows, alders, birches, and evergreen members of the heath family, such as species of *Arctostaphylos*, *Vaccinium*, *Ledum*, and *Rhododendron*, are most abundant. (2) The Sub-arctic region, a circumpolar zone, begins at the northern limit of trees and extends to the southern limits of northern conifer forests. It contains many species common to the Arctic region mingled with others, making a much richer flora, in which species of *Abies*, *Picea*, and *Pinus* are the conspicuous trees. In North America the white and black spruces (*Picea canadensis* and *P. mariana*), the balsam fir (*Abies balsamea*), and the gray pine (*Pinus banksiana*), together with the white birch (*Betula papyrifera*) and aspen (*Populus tremuloides*), dominate the forests. The southern boundary passes from Maine along the St. Lawrence and Ottawa rivers to lakes Huron and Superior, where it bends northward, bordering the prairies of Manitoba and Alberta. In the western mountain region the southern limit is not well defined. (3) The Central European region, having its southern limit in France and westward at about the northern limit of the

vine, and the corresponding (4) Central Asiatic region, often subdivided into western, central, and eastern subregions, are vast areas naturally covered by grasslands and forests, oaks, beech, and pines being among the most abundant trees. Under cultivation they have become the home of cereal culture and allied forms of agriculture. The corresponding areas of America are occupied by (5) the Atlantic and (6) Pacific North American regions, with their deciduous forests in the east, their prairies and plains in the centre, and their conifer-clad mountains in the west. This too is one of the most important agricultural regions of the world. Finally, there are (7) the Mediterranean region, extending through southern Europe and including Africa to the Sahara desert, with cool wet winters, hot dry summers, and an abundance of broad-leaved evergreen trees like the olive and laurel, and (8) the somewhat allied Macronesian Island region containing the Azores, the Madeiras, and the Canaries. These islands are remarkable for a great development of the Ericaceæ (q.v.) and for the large number of endemic species.

II. **The Paleotropical Realm** includes the land areas of the Eastern Hemisphere contained within the tropics. It contrasts with the Boreal in having few widespread forms and in possessing a much vaster diversity of genera and species. Within it conditions for growth vary from the most arid deserts, practically without plants, to rainy tropics with the most luxuriant forests of the world. It has been variously subdivided. See PALEOTROPICAL REGION.

III. **The Neotropical Realm** is limited to tropical America and coincides with a similar division of zoögeographers. (See DISTRIBUTION OF ANIMALS.) Its subdivisions are: (1) the Central American region, including tropical Mexico, (2) the Antillean region with southern Florida and the West Indian Islands, (3) the Tropical South American region, and (4) the Austral South American region, including Chile, Argentina, Patagonia, and Juan Fernández Island. This last region is temperate rather than tropical in its climate, and includes rich temperate rain forests in southern Chile, plantless deserts in Bolivia, dry grasslands in Argentina, and treeless regions somewhat comparable to tundra in Patagonia, where it passes into the next realm.

IV. **The Antarctic Realm**, comprising the southern tip of South America and the regions within the Antarctic circle, contains: (1) the Austral American region, beginning with deciduous forests in Patagonia and extending through the shrubby areas of Tierra del Fuego to the treeless areas of the Falkland Islands and South Georgia. The forms and even some of the species are the same as in the Arctic region, although there are a greater paucity of species and many more endemic forms, owing doubtless to the lack of continuous land areas. Upon the Falkland Islands grass-grown tundras are characteristic, especially the remarkable tussock grass association composed principally of *Poa flabellata* fringing the beach. (2) The Austral Australasian region begins with the mountains and southern islands of New Zealand and includes Auckland and adjacent islands; (3) the Austral Indian Ocean region includes a few small islands with a scanty endemic flora, and (4) the Antarctic Continental region is plantless.

V. The Oceanic Realm includes all the oceans and its flora consists almost exclusively of algæ (q.v.), together with the minute floating plankton (q.v.). The vegetation is most abundant in colder seas, but there is greater diversity of species towards the tropics. There is much greater uniformity than on land, resulting in but three regions: (1) the Boreal region, with the greatest mass of vegetation, consisting mostly of the brown algæ (Phæophyceæ, q.v.), which include the great kelps that are among the giants of the plant world; (2) the Tropical region, with its smaller red algæ (Rhodophyceæ, q.v.) and vast areas covered with *Sargassum* (q.v.); and (3) the Austral region, similar to the Boreal but showing much less luxuriance.

Consult: V. M. Spalding, *Distribution and Movements of Desert Plants*, published by the Carnegie Institution (Washington, 1909); J. W. Harshberger, *Phytogeographic Survey of North America* (New York, 1911). Details of the flora of the various regions may be found under the various names of the regions and in articles under the names of the various countries. See DISTRIBUTION OF PLANTS and bibliography there given.

PHYTOLACCA (Neo-Lat., from Gk. *φυτόν*, *phyton*, plant + Neo-Lat. *lacca*, lac, from Pers. *lak*, *luk*, Hind. *lakh*, from Skt. *laksā*, lac insect, from *lākṣā*, hundred thousand, referring to the numbers of insects in each nest; so called from the crimson juice of the berries). A genus of about 20 species of dicotyledonous herbs and half shrubs of the family Phytolaccaceæ, natives of warm parts of Asia, Africa, and America. *Phytolacca decandra*, the poke or pocan, a native of North America, now naturalized in some parts of south Europe, is occasionally cultivated for its young shoots, which are eaten like asparagus. The juice of the berries, which are about the size and color of black currants, is employed in the adulteration of wine. The young shoots of *Phytolacca acinosa* are boiled and eaten in the Himalayas. Under the name *Phytolacca esculenta* it has been introduced into gardens.

In medicine *Phytolacca* is official under either of two forms, the fruit or the root of *Phytolacca decandra*, or poke, also called pigeon berry and garget root. The fruit is a small, deep purple, compound berry, nearly round, with a sweet and slightly astringent taste. The root is "large, branched, fracture fibrous, inodorous, sweetish, and acrid" (Potter). A fluid extract and a tincture are the preparations used, besides the berry and the root. The active principle is phytolaccin. Poke has been used in ulcers, eczema and other skin diseases, chronic rheumatism, mastitis, tonsillitis, and pharyngitis. It has been used to decrease adipose tissue and thus reduce obesity since 1858. When given in large doses phytolacca causes nausea, depression, vomiting, and purging. It lowers somewhat the rate of respiration and also weakens the heart's action, and has caused convulsions. See POKE, and Colored Plate of POISONOUS PLANTS.

PHYTOPH'THORA (Neo-Lat., from Gk. *φυτόν*, *phyton*, plant + *φθορά*, *phthorā*, destruction). A genus of the Phycmycetes (q.v.) best known by the species *P. infestans*, which infects potatoes and induces the disease known as potato rot, a disease of great economic importance. The mycelium vegetates in the green

parts of the plant, causing wilting and withering of the leaves and stems, the spore-bearing branches being sent to the surface in immense numbers. The mycelium winters in the tubers, and its presence leads to the discoloration and final decay often observed in the centre of the tubers. The economic importance of this disease may be inferred from the fact that it has been the chief cause of the famines in Ireland.

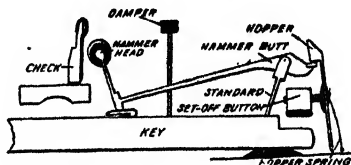
PHYTOSTERIN. See CHOLESTERIN.

PIACABA. See PIASSABA.

PIACENZA, pyä-chěnt'sā. The capital of the Province of Piacenza, Italy, situated on the right bank of the Po, 2 miles below its confluence with the Trebbia, 43 miles by rail south-east of Milan (Map: Italy, B 2). The city is gloomy in appearance, though its thoroughfares are broad and regular. The Stradone is one of the most beautiful streets in Italy. Piacenza occupies a position of great strategic importance and is fortified with solid walls and a strong castle. The Italian government has strengthened and extended these fortifications by the construction of external defensive works and by a formidable entrenched camp. The city has numerous fine palaces and churches. The cathedral, an edifice in the Lombard-Romanesque style, was built between 1122 and 1233. It has frescoes by Guercino and L. Carracci, and a large crypt with 100 columns. The entire building was restored about the beginning of the twentieth century. The Church of Sant' Antonino, the original cathedral of Piacenza, has been several times rebuilt. The early Renaissance Santa Maria di Campagna has excellent mural paintings by Pordenone. The noteworthy San Sisto, an ancient church rebuilt in the Renaissance, gave its name to Raphael's Sistine Madonna (sold by the monks in 1754 to Frederick Augustus II, Elector of Saxony). Among the other principal buildings are the immense Palazzo Farnese, begun in 1558 and never completed, once famous, but since 1800 serving as barracks; the fine Palazzo Municipale, dating from the thirteenth century, with its arched arcades and pinnacles; and the Palazzo dei Tribunali, with curious courts, now in ruins. The principal square is the Piazza dei Cavalli, so called from the colossal bronze equestrian statues of the dukes Alessandro and Ranuccio Farnese. There are a public library with over 142,000 volumes, a splendid theatre built in 1803, two new theatres, several secondary and technical schools, several hospitals, and an arsenal. Piacenza has manufactures of silk, cotton and woolen goods, hats, pottery, and machinery, and a trade in wine, grain, cheese, and marble from its quarries. Pop. (commune), 1881, 34,987; 1901, 35,952; 1911, 38,542; 1914, 39,658.

Piacenza, the ancient Placentia, was founded by the Romans in 219 B.C. In 200 B.C. it was plundered and burned by the Gauls, but recovered its prosperity with the construction of the Æmilian military road. In the twelfth century it became a member of the Lombard League. In 1545 Piacenza, along with Parma, was erected into a duchy for the Farnese family. (See PARMA.) An important battle occurred here in 1746 in which the allied French and Spaniards were defeated by the Austrians. Consult Giarelli, *Storia di Piacenza* (Piacenza, 1889), and Leo Jordan, "Die Renaissance in Piacenza," in *Archiv für Kultur-Geschichte*, vol. v (Berlin, 1907).

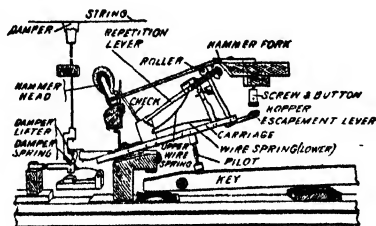
extreme lightness characteristic of the Viennese action. Stein's son-in-law, Streicher, in 1794 further improved this action and established a great reputation for his instruments. France was supplied chiefly with English pianos until Erard (a German whose name originally was



STREICHER'S GRAND PIANOFORTE ACTION.

Erhardt) settled in Paris in 1777. The Revolution drove him to London, where he made himself thoroughly familiar with English methods. Even after his return to Paris Erard continued to use the English action, but meanwhile he was seeking some improvement. His experiments resulted in 1821 in the double escapement action, which soon spread the fame of Erard all over the world. The next important manufacturer in France was again a native German, Pape, of Hanover. Pape invented, in 1827, a down-striking action where the action is above the strings. He also substituted felt for leather in the covering of the hammers (1830). But this departure had already been made a few years previous by Babcock, of Boston.

In order to save space some English makers towards the end of the eighteenth century conceived the idea of building pianos in an upright form. The first attempts consisted in nothing more than turning a grand or square instrument on one side. The first genuine upright was patented (1800) in England and the United States by John Isaac Hawkins, an Englishman living in the latter country. It is remarkable for containing most of the features which distinguish the modern upright. In the direct line of piano development, however, we owe a greater debt of gratitude to Southwell, who after 14 years of experimenting exhibited in 1807 the first upright piano that yielded practical results. This he called the Cabinet. In 1811 he built

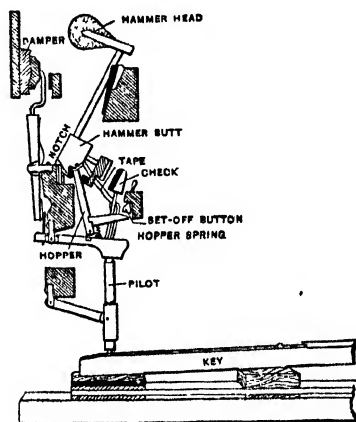


FRENCH GRAND PIANOFORTE ACTION.

another instrument which shows many decided improvements. Wornum still further improved this model by the introduction of diagonal stringing. The increased length of the strings yielded a more powerful tone. He also invented a new action principle (the so-called lever-check action), which was taken up and further improved by Pleyel of Paris, in which form it became known as the French action.

It must not be imagined that the pianoforte immediately upon its appearance at the beginning of the eighteenth century superseded

the harpsichord or clavicembalo. These instruments continued to be made; the clavicembalo especially kept its position in the orchestra throughout the century. Composers still wrote for the harpsichord. The earliest known composition written especially for pianoforte appeared in 1771. The composer, a certain Mützel, entitles it "Duetto für zwey Claviere, zwey Forte-piano oder zwey Flügel." But the technique is not different from that of the harpsichord. The first compositions written especially for the pianoforte and showing a technique characteristic of the new instrument are three sonatas (op. 2) by Muzio Clementi, published in 1773. From that time on composers began to study the peculiarities of the pianoforte and to employ the proper technique. The colossal pianoforte works of Beethoven were destined to revolutionize the manufacture of pianofortes. Many of his pianoforte works were beyond the capabilities of the



ENGLISH UPRIGHT PIANOFORTE ACTION.

instrument at that time. Thus he gave a powerful stimulus to piano builders to increase both the compass and power of the pianoforte. In order to obtain power of tone the thickness of the strings had to be increased; to extend the scale the number of strings had to be increased. Manufacturers had to devise some frame capable of withstanding this enormous increase of tension. This led to the use of metal. In 1820 Allen and Thom patented a frame consisting of hollow metal tubes with brass and iron plates supported by heavy wooden crossbars. This was soon adopted by the leading manufacturers. Babcock, of Boston, in 1825 tried a cast-iron frame, and in 1832 Allen produced a frame that combined the string plate, tension bars, and wrest plank in one casting. This was still further improved by Chickering in 1837. In 1859 Steinway and Sons, of New York, added to the metal frame in one casting an agraffe, which is a small metallic support for the string, inserted between the bridge and the string for the purpose of preventing vibration in that part of the string. The same firm introduced also a double overstrung scale, which is obtained by dividing the strings into two sets, so that one set lies diagonally across the other.

Besides the improvements mentioned innumerable others have been and are still being made. From the four-octave instrument of Cristofori with a moderate tension, supported by a wooden sounding board, the modern pianoforte has de-

veloped into an instrument of tremendous tone power with a compass of over seven octaves and a tension amounting to several tons. A modern pianoforte consists of the following parts: (1) The frame, now almost universally made of iron cast in a single piece. At the rear end is attached the string plate, into which the strings are fastened. In the front there is the wrest plank, into which the tuning pins are set. Around these is wound the other end of the strings, and by turning these pins the tension of the strings is regulated. (2) The sounding board, a thin piece of wood placed under the strings for the purpose of reinforcing the tone by means of sympathetic vibration. (3) The strings, made of steel wire, increasing in length and thickness from the treble to the bass. The lower ones are made heavier by being overspun, i.e., wound around with a coil of thin copper wire. For the very lowest tones only one wire is used (A_2 - F_2). Then two strings for each tone (G_2 - C); above that three strings. (4) The action, the entire mechanism required for propelling the hammers against the strings. This includes the keyboard, a row of keys manipulated by the fingers. The keys corresponding to the natural tones are made of ivory, those corresponding to the chromatically altered tones, of ebony. When a key is pressed down the rear end rises and lifts a rod, called jack, which, in turn, throws the hammer against the string or strings. At the same time a damper is raised. The hammer, having struck the string, falls back immediately and is caught by a check, preventing a rebound. But as long as the key is pressed down the damper remains raised and thus allows the string to vibrate freely. (5) The pedals, levers pressed down by the feet. (a) The forte or loud pedal raises all the dampers, so that all the strings struck continue to vibrate even after the keys are released. (b) The soft pedal, which either throws all the hammers nearer to the strings, so that the striking distance is diminished by one-half, or shifts the hammers a little to one side, so that only a single string instead of the two or three is struck. (c) Some pianos have a third or sustaining pedal which does not raise all the dampers, but keeps raised only such as are raised by the keys at the moment this pedal is applied. It is the skillful use of these pedals that produces the wonderful variety of tone and tonal coloring which has become one of the chief factors in the art of modern piano playing. (d) Recently many upright pianos have been built in which the application of a pedal interposes a strip of felt between the hammers and strings, so that only a very faint sound is produced. This is a great convenience while practicing, and this device has made superfluous all digitariums or dumb keyboards, and even the one-time famous practice clavier, the use of which has always been justly opposed by musicians. (6) The case. According to the shape of the case, pianos are classified as grand, square, and upright. The square form is no longer built. For use in private homes they have been entirely superseded by the uprights, which latter take up far less room. The grand pianos are built in various sizes, from the full concert grand, 8 feet, 10 inches long, to the parlor or baby grand, 6 feet long. The cases are often very elaborately carved or even inlaid. Special instruments have been made that cost \$50,000.

For the sake of completeness it is necessary to speak briefly about some inventions made in connection with the pianoforte. There is a device for increasing the volume of tone. This is the æolian attachment, an arrangement by means of which a current of air is directed against the strings, reinforcing the vibrations and thus causing a considerable increase in the volume and duration of the tone. In 1891 Dr. Eisenmann, of Berlin, invented the electric piano. Besides the ordinary hammer action this instrument has an electromagnet attached to each string. By pressing down the keys an electric circuit is closed, and the action of the electromagnets causes a steady vibration of the strings. When the electric action is employed alone the tone of the piano closely resembles that of the stringed instruments. By means of a special pedal any tone or chord can be sustained at will even after the fingers have left the keys. The electric action or the hammer action may each be employed separately or both may be combined.

Piano Players. In the course of the nineteenth century numerous attempts were made to construct automatic pianos, and some of these were quite successful so far as the merely mechanical reproduction of the notes was concerned. But the soulless playing of these instruments, with its clocklike regularity and monotony, repelled people of musical instinct. The invention of the perforated paper roll, in 1887, revolutionized the construction of automatic instruments. The substitution of this roll for the older cylinders opened a vista of undreamt-of possibilities for the attainment of really artistic expression. By the end of the century a number of automatic pianos, such as the pianola, capable of yielding excellent results, were upon the market. As soon as the public discovered their merit a sudden and rapidly increasing demand sprang up, which stimulated the various makers towards attainment of perfection. Since 1900 so many patents have been taken out, so many claims for priority of invention have been advanced, that the historian is fairly bewildered and utterly unable to judge the merit of individual claims. Two kinds of players are now built. In one the mechanism is contained in a box which can be placed against the keyboard of any ordinary piano. In the other the mechanism is built into the piano in such a way that it can be disconnected at will whenever it is desired to play the piano by hand in the usual manner. Both players are constructed upon the same mechanical principles. A pair of bellows, originally operated by treadles, as in the parlor organ, but now generally by electricity, furnishes compressed air, thus causing the roll to revolve and unwind upon another roll. The perforations in the paper, passing over a row of small orifices, regulate the admission or exclusion of the air current which operates the fingers that strike the keys. All this is merely automatic; but a few ingenious devices enable the operator to secure absolutely individual interpretation. By means of a small lever the degree of loudness can be regulated. The pedal stop controls both the loud and the soft pedal. The metrostyle permits any variation of tempo. By means of the themodist it is possible to bring out with special emphasis certain melodic phrases, particularly those in the inner voices or bass. Most manufacturers have their rolls marked by eminent pianists for subtle modifications of tempo.

This is attained by an undulating red line on the right-hand side of the roll, and the operator need only see that the index needle of the metrostyle follows this line. The immense popularity of these piano players attests the widespread interest in music, and the instrument itself has become a most powerful factor in the education of the public taste. The exports of player pianos from the United States in 1914 were valued at \$335,299; other pianos, \$1,416,888; piano players, \$177,683; perforated music rolls, \$127,626.

In a class separate from the piano players just described is the autograph piano, which reproduces in its minutest details the performance of the individual artist. Perforated rolls, known as autograph rolls, are prepared by a secret process. The mechanical operation of the piano does not differ in any material respect from that of the usual machine. There is, of course, no need of any of the devices controlling interpretation on the part of the operator. The purpose of the invention is the preservation for posterity of the art of the individual artist.

Bibliography. E. F. Rimbault, *The Piano: Its Origin, Progress, and Construction* (London, 1860); Oskar Paul, *Geschichte des Klaviers* (Leipzig, 1868); Ponsicchi, *Il pianoforte, sua origine e sviluppo* (Florence, 1876); Daniel Spillane, *History of the American Piano* (New York, 1890); K. F. Weitzmann, *History of Pianoforte Playing and Pianoforte Literature*, English translation from third German edition by Theodore Baker (ib., 1893); Ernst Pauer, *A Dictionary of Pianists and Composers for the Piano, with an Appendix of Manufacturers of the Instrument* (London, 1895); A. J. Hipkins, *Description and History of the Pianoforte and of the Older Keyboard Stringed Instruments* (ib., 1896); W. B. White, *Theory and Practice of Pianoforte Building* (New York, 1906); id., *Technical Treatise on Piano-Player Mechanism* (ib., 1908); Blüthner and Gretscher, *Der Pianofortebau* (3d ed., Leipzig, 1909); H. E. Krehbiel, *The Pianoforte and its Music* (New York, 1911); Alfred Dolge, *Pianos and their Makers* (Eng. trans., 2 vols., Covina, Cal., 1911-13); W. B. White, *Player-Piano Up-to-Date* (New York, 1914); H. L. Van Atta, *Treatise on the Piano and Player-Piano* (Dayton, Ohio, 1914); Joseph Hofmann, *Piano Playing* (New York, 1914); J. A. Johnstone, *Essentials in Piano Playing* (ib., 1914).

PIANO'LA. See PIANOFORTE.

PIANO PLAYER. See PIANOFORTE.

PIARISTS, pi'a-rists (from Lat. *pius*, pious), or FATHERS, or CLERKS REGULAR, OF THE PIOUS SCHOOLS. A religious congregation for the education of the poor, founded at Rome at the end of the sixteenth century by St. Joseph of Calasanza. He was a Spanish priest who, while in Rome, was struck with the imperfect and insufficient character of the education of even the higher classes and decided to devote himself wholly to the meeting of this want. In 1597 he opened a school, with the assistance of a few like-minded friends, which rapidly increased until, seven years after, it numbered 900 pupils and in 1613 as many as 1200. In 1617 the associates were recognized as a congregation by Paul V, and in 1621 as a religious order by Gregory XV. It spread during the seventeenth century into various European countries, and now has over 120 houses and about 40,000

pupils, principally in Italy, Spain, and America. The general, who is chosen for nine years, resides in Rome, where general chapters are held every six years. The system of education adopted in their schools is very thorough, and in many ways resembles that of the Jesuits, with whom the Piarists have always had some affinity; on the suppression of the Society of Jesus they received many of its members into their ranks. Consult Brendler, *Das Wirken der PP. Piaristen* (Vienna, 1896).

PIABOA, pe'a-rô'a. An Indian tribe of the upper Orinoco, near the mouth of the Mataveni, a tributary on the left bank. Their language appears to be unconnected with any other stock. Consult: Crévaux, in *Bibliothèque linguistique américaine*, vol. viii (Paris, 1882); Chaffanjon, *L'Orinoco et le Caura* (ib., 1889); Christian Brinton, *The American Race* (New York, 1891); A. Ernst, "Upper Orinoco Vocabularies," in *American Anthropologist*, vol. viii (Washington, 1895); A. F. Chamberlain, in *Journal de la Société des Américanistes de Paris*, N. S., vol. vii (Paris, 1910).

PIASSABA, or **PIACABA**, pe'a-sâ'bâ (Portug. *piassava*, *piacab*, from the native Brazilian name). A remarkable and important vegetable fibre produced by one or more species of South American palms. The greater part is furnished by the coquilla-nut palm (*Attalea funifera*), but Wallace states that much of it is produced from a species of *Leopoldinia*, which he has named *Leopoldinia piassaba*. This quality is known commercially as Pará piassaba. When the leaves decay the petioles split up into cylindrical, dark-brown, hard fibres varying from the thickness of a horsehair to the size of a quill. This material has been widely used in making coarse brushes, particularly those required for street-sweeping machines, for which purpose the coarsest have almost superseded all other kinds. The smaller fibres are used for finer brushes. In Brazil cables, baskets, hats, and many other articles are made from this fibre. Large quantities are exported. See **ARTALEA**; **CHIQUECHIQUE PALM**.

PIATIGORSK, pyä'té-görsk'. A town in Russia. See **PYATIGORSK**.

PIATRA, pyä'trá. A town of Moldavia, Rumania, situated on the Bistritza, about 55 miles southwest of Jassy (Map: Balkan Peninsula, F 1). It has a large number of churches and monasteries and is an important centre in the lumber trade. It is connected by rail with Bucharest. Pop., 1901, 17,391.

PIATT, pi'at, DONN (1819-91). An American lawyer and journalist. He was born in Ohio, was educated at St. Xavier College, Cincinnati, studied law, and was in 1851 elected judge of the Common Pleas Court. During President Pierce's administration he was Secretary of the Paris Legation, and for some months was acting chargé d'affaires. He enlisted in the Civil War and rose to the rank of colonel of volunteers, having served for the greater part of the war as adjutant general on General Schenck's staff. After the war he was a newspaper correspondent and founded the *Washington Capital*. His publications include *Memoirs of the Men Who Saved the Union* (1887) and the poem, *The Lone Grave of the Shenandoah* (1888). Consult C. G. Miller, *Work and Ways of Donn Piatt* (1893).

PIATT, JOHN JAMES (1835-1914). An American journalist and poet, born at James Mills,

Ind. After studies at Capital University and Kenyon College he was connected with Louisville and Cincinnati journals, and in 1871 was chosen librarian of the House of Representatives. From 1882 to 1893 he served as United States Consul at Cork and Dublin, Ireland. His poems are collected under many titles, among which are: *Poems of Two Friends* (1860), with W. D. Howells; *The Nests at Washington* (1864), with Mrs. Piatt; *Poems in Sunshine and Firelight* (1866); *Western Windows* (1869); *Landmarks, and Other Poems* (1871); *Idylls and Lyrics of the Ohio Valley* (1884, 1888, 1892); *At the Holy Well* (1887); *The Ghost's Entry, and Other Poems* (1895); *Odes in Ohio, and Other Poems* (1897). In prose he is represented by his *Penned Fly-Leaves* (1880) and *How the Bishop Built his College in the Woods* (1906)—His wife, SARAH MORGAN (BETAN) PIATT, became known for various volumes of verse. She issued her *Collected Poems* in 1894.

PIAUHY, p'ou-é'. A state of northeast Brazil, bounded on the east by the states of Ceará and Pernambuco, on the south by Bahia, on the west by Goyaz and Maranhão, and on the north by Maranhão and the Atlantic Ocean (Map. Brazil, J 5). Area, 92,670 square miles. The surface consists of vast plains broken by low ranges of hills. There are no forests and the climate is dry and hot, with frequent droughts. The chief rivers are the Parnahyba, forming the west boundary, and its tributaries. Agriculture is hindered by droughts and the scarcity of population, and the attempts to establish colonies of foreign immigrants have not been successful. The chief products are cotton, tobacco, and rubber. Stock raising is extensive and some cotton weaving is carried on. The mineral wealth, including iron, copper, sulphur, and silver, is not exploited. Pop., 1900, 334,328, 1913 (est.), 425,000, mostly of mixed race. The capital is Theresina (qv).

PIAZZA ARMERINA, pè-ât'sâ ür-mâ-ré'nâ. An episcopal town in the Province of Caltanissetta, Sicily, 18 miles southeast of Caltanissetta (Map: Italy, E 6). It stands on the crest and slopes of an isolated hill 1550 feet above the sea, on the left bank of the Terranova. It is the residence of many nobles and landowners. The town has a Renaissance cathedral (1517), an old castle now used as a prison, a Gymnasium, a seminary, a technical school, a library, and a picture gallery. The trade is chiefly in corn, wine, oil, fruits, and nuts; and there is also some furniture produced. Piazza Armerina was founded by the Greeks. It was destroyed in 1160, but was soon rebuilt. Pop. (commune), 1901, 24,379; 1911, 32,070.

PIAZZA DELLA SIGNORIA, dël'lâ sê'nyô-ré'a. See FLORENCE.

PIAZZA DEL POPOLO, pò'pò-lò. See ROME.

PIAZZA DI SPAGNA, spâ'nyâ. A square in Rome named from the Palazzo di Spagna, the residence of the Spanish ambassador. It is the centre of the foreign colony. Its most noted feature is the famous Spanish steps, leading to the church of the Trinità de' Monti, and the resort of picturesquely clad artists' models.

PIAZZA NAVONA, nâ-vô'nâ. The second largest public place of Rome, laid out on the site of the Stadium of Domitian, on the ruins of which the surrounding buildings rest. The piazza, officially called the Circo Agonale, corresponds in size and shape to the ancient stadium, and contains three fountains and an obelisk in

honor of Domitian, originally in the circus of Maxentius.

PIAZZA VENEZIA, vâ-nâ'tsé-a. See ROME.

PIAZZI, pè-ât'sé, GIUSEPPE (1746-1826). An Italian astronomer, born at Ponte, July 16, 1746. He is known principally for his work at Palermo, where he went in 1781 to take the chair of mathematics and where he established an observatory, which was put in working order in 1789. The first results of his observations were the corrections of some errors in the estimation of the obliquity of the ecliptic, the aberration of light, the length of the tropical year, and the parallax of various heavenly bodies. These results were published in 1792. On the night of Jan. 1, 1801, he discovered a new planet, the first known of the planetoids (q.v.). Piazzi was able to obtain only a very few observations of it before it passed too near the sun to be visible; from these observations Gauss (q.v.) was able to compute its orbit so that it was again found later in the year. Piazzi named it Ceres, after the ancient goddess of Sicily. In 1803 he published a catalogue of the fixed stars, the result of 10 years' observations and far superior to any before published. He was rewarded with a prize from the Institute of France. In 1814 appeared a new and more complete catalogue, containing 7646 stars, for which he was again rewarded with a prize from the French Institute. This catalogue is now regarded as his work of most lasting value to astronomy, and a new computation of his observations, by modern methods, is now being made. He also made researches into the nature of comets. In 1817 he was called to Naples as chief director of the government observatory, where he remained till his death, July 22, 1826. He wrote *Lezioni elementari di astronomia* (2 vols., 1817). Consult B. E. Maineri, *L'Astronomo Giuseppe Piazzi* (Milan, 1871).

PI-BESETH, pè-bâ'séth. See BURASTIS.

PIBROCH, pè-bròck (Gael *piobaireachd*, art of playing on the bagpipe, from *piobair*, piper, from *piob*, bagpipe + *feair*, OIr. *fer*, man, connected with Lat. *vir*, Lith. *wyras*, Lett. *wirs*, Skt. *vira*, Goth *waír*, AS, OHG. *wer*, man). The highest form of music written for the bagpipe. It consists of a series of variations written on a fundamental theme called *urlar*. These variations (generally three or four in number) increase in difficulty and speed, the last one, *creanluadh*, being a furious *presto*. What renders the notation of pibrochs particularly difficult is the great number of ornaments introduced, so that no definite rhythm can be discovered. A still greater difficulty is encountered because they make use of the eleventh overtone (a tone between f and f#) and thus cannot be reduced to any scale. Only in comparatively recent times (nineteenth century) has the expression of pibrochs in our notation been attempted. Before that all music for the bagpipe was taught by a special system, the different tones having such names as *hodroho*, *hananin*, *hiechin*, etc. An excellent collection of pibrochs was published in 1900 by Major General Thomson under the title *Ceol Mor*. See BAGPIPE.

PICA, pí'ká. See PRINTING.

PICA. See BULIMIA.

PICABIA, pè'ká'byá', FRANCIS (1878-). A French post-impressionist painter. He was born in Paris, where his artistic training was obtained. His work marks the transition from

cubism to orphism, a later phase of post-impressionism (q.v.) in France. Although Picabia possesses undoubted talent for form and color, he seeks, like a musician, to create an atmosphere, to arouse intellectual and spiritual sensations by means of rhythmic lines and harmonious improvisations of color, mainly cubical in form, rather than to give a transcription or recollection of reality. He was represented at the International Exhibition of Modern Art, New York, in 1913 by "The Dance at the Spring," "The Procession, Seville," "Paris," and "Souvenir of Grimaldi." In March, 1913, his impressions of New York were exhibited at the Photo-Secession Galleries, New York. He did much interesting work for the New York magazine called 291.

PICANDER. The pseudonym of the German poet Christian Friedrich Henrici (q.v.).

PIC'ARD. A corruption of Beghard. See BEGUINES.

PICARD, pé'kär', ALFRED (1844-1913). A French engineer and administrator, born at Strassburg. He attended the lycées of Nancy and Strassburg and the Ecole Polytechnique, graduating in 1864. Later he traveled extensively and returned to France to take part in the War of 1870-71. He was best known for the part he took in organizing the Exposition of 1900 as commissioner general. In 1904 he was a delegate to the St. Louis World's Fair. He was Councilor of State (1882-86), Minister of the Navy (1908), at various times was intrusted with engineering work by the government, and served as Inspector General of Bridges and Highways. He became a member of the Academy of Sciences and Grand Officer of the Legion of Honor. Picard's writings include: *Alimentation du canal de la Marne au Rhin et du canal de l'Est* (1881); *Les chemins de fer français* (6 vols., 1883-84); *Traité des chemins de fer* (4 vols., 1887); *Traité des eaux* (4 vols., 1890-94); *Rapport général sur l'exposition universelle et internationale de 1889* (10 vols., 1891-92), his greatest work; *Monographie de l'exposition universelle de 1889* (2 vols., 1895); *Rapport général administratif et technique sur l'exposition universelle de 1900* (1902-03); *Le bilan d'un siècle* (1906-07).

PICARD, (CHARLES) EMILE (1856-). A French mathematician, born in Paris and educated at the Ecole Normale Supérieure. He was lecturer on mathematics at Paris (1877) and at Toulouse (1879-81) and in 1886 became professor of the same subject at the Ecole Normale and at the Sorbonne. His principal works are: *Traité d'analyse* (3 vols., 1891-96; 2d ed., 1901-08); *Théorie des fonctions algébriques de deux variables indépendantes* (1897-1906), with G. Simart; *Sur le développement de l'analyse et ses rapports avec diverses sciences* (1905), lectures delivered in America.

PICARD, JEAN (1620-82). A French astronomer, born at La Flèche. In 1655 he succeeded Gassendi as professor of astronomy in the Collège de France. In 1666 he became a member of the Academy of Sciences. In 1671 he went to Uraniborg, on the island of Hven in the Sound, to determine the latitude and longitude of Tycho Brahe's observatory. The Paris Observatory and the *Connaissance des Temps* were founded by his efforts. He is known especially for his geodetic work in connection with determining by measurement the exact length of a degree of latitude.

PICARD, LOUIS BENOIT (1769-1828). A French dramatist, born in Paris. He began early to write plays, the first of which was *Le badinage dangereux* (1789). In many that he subsequently produced he was both author and actor, and he had several collaborators. His plays, excellent pictures of the time, are satirical and vivacious and have animated dialogue. The best include: *Encore des ménechmes* (1791), which made his reputation; *Médiocre et rampant* (1797); *Les marionnettes* (1807); *Les capitulations de conscience* (1809); *L'Intrigant maladroît* (1820). Several of them are printed in his *Théâtre* (8 vols., 1821) and *Théâtre républicain* (1832).

PICARD, LOUIS JOSEPH ERNEST (1821-77). A French politician, born in Paris. In 1858 he was elected to the Legislative Corps, where he was a member of the group known as Les Cing, and was reelected in 1869. In 1870 he became Minister of Finance in the government of the National Defense; with Jules Favre arranged for the capitulation of Paris in 1871; and then for a short time was Minister of the Interior in Thiers's cabinet. In 1871-73 he was Ambassador at Brussels; then resumed his seat in the Chamber of Deputies, to which he had been elected in 1871; and in 1875 became a life Senator. He was one of the leaders of the Left Centre. Picard founded a democratic weekly, *L'Electeur libre*, in 1868.

PIC'ARDY (Fr. *Picardie*). Formerly a province of France, now constituting the Department of Somme and parts of the departments of Pas-de-Calais, Aisne, and Oise. Its principal town was Amiens (Map: France, N., H 3). In 1167 Philip of Alsace, Count of Flanders, became Count of Picardy. It was acquired by Burgundy in 1435 and was united to France in 1477.

PICASSO, pé-käs'só, PABLO (1881-). A Spanish post-impressionist painter and sculptor, born in Malaga. He was the founder of cubism, which he developed after many changes of style. Although an able technician, Picasso came to recognize color only in effects of light; he seeks what he calls the psychical, not the physical, manifestation of form. The former is for him a matter of surfaces suggesting geometrical harmonies; he wishes his work to be judged by the abstract sensation it produces. In the post-impressionist exhibition at the Grafton Galleries, London (1912), and in the International Exhibition of Modern Art in New York (1913) Picasso was well represented by both paintings and sculptures. Consult J. G. Huneker, *The Pathos of Distance* (New York, 1913).

PIC'CADILLY. An important London street extending for about a mile between the Haymarket and Hyde Park Corner. One portion of the street contains many handsome shops, while the other is given up to fashionable residences. The name is referred to a kind of lace, fashionable in Queen Elizabeth's time, or to the collars so called during the reign of James I.

PICCINI, or PICCINNI, pé-ché'né, Niccolò (1728-1800). An Italian composer. He was born in Bari and studied with Durante and Leo at the Conservatory of Sant' Onofrio, Naples. After producing a number of operas at Naples he removed to Rome, where he brought out *Alessandro nell' Indie* (1758); *Cecchina zitella, ossia la buona figliuola* (1760), which had an unparalleled success; and *L'Olimpiade* (1761).

In 1776 he went to Paris, where Gluck was then the popular composer. Marmontel and others championed Piccini, and for several years a bitter controversy was carried on between the Piccinists and the Gluckists. Marmontel made a modern version of Quinault's drama *Roland*, and Piccini composed an opera on it, which had great success. He also composed *Iphigénie en Tauride*, a subject on which Gluck also had written an opera, *Atys*, and many others. He was professor in the Ecole de Chant (1783-91), was removed, and returned to Naples, where he suffered much annoyance from the espionage of the government on account of his supposed revolutionary sympathies. Returning to Paris in 1798, he succeeded in obtaining from Bonaparte the inspectorship of music at the National Conservatory, but he did not live to begin the duties of his office. He is of interest to the musical historian not so much for the quality of his work or his ability as an artist as for the important part he played in the overthrow of Logroscino (q.v.), whose buffo operas were then the vogue in Naples, and for his own defeat (together with the ideas for which he stood) by Gluck (q.v.). He was a most prolific composer, author of 131 operas and several oratorios. He died at Passy, near Paris.

PICCININO, pè'chè-nè'nò, NICOLÒ (1375-1444). An Italian soldier, born at Perugia. He entered the band of condottieri led by Braccio da Montone, and after the death of their chief was elected to succeed him. For a short time he served Florence, but in 1425 went over to Filippo Maria Visconti, of Milan. Fighting in his interest, he defeated Carmagnola and the Venetians at Soncino and at Cremona (1431), and at Imola in 1434 gained a victory over the Venetians and Florentines. He captured Bologna in 1438. The city revolted from Piccinino's rule in 1443 and, overcome by reverses and the loss of his son, he died the next year.

PICCIOLA, pèt'chò-là. A pathetic story by Saintine (1836) of a prisoner in the time of Napoleon I who beguiles the monotony of his confinement by caring for a plant which springs up between the stones of his cell and which he calls Picciola (poor little one).

PICCIRILLI, pèt'chè-rè'l'ì. A family of sculptors and marble cutters, the best known of them being ATTILIO (1866-). He was born in Massa, Italy, studied at the Academy of San Luca in Rome, and emigrated to New York in 1888. He was at first assistant to various sculptors less skilled in marble cutting than he, then exhibited independent works like "The Dancing Faun" (1904), "Thought" (1908), and "Mater Consolatrix" (1909). Among his best portrait busts are "My Brother Furio" and those of Mrs. Newcomb and Dr. Brann. His more ambitious undertakings include the MacDonough Monument, New Orleans (1898), the sculptures of the national Maine Monument, New York (1903-13), which received much hostile criticism, and the Firemen's Memorial (1913), Riverside Drive, New York. His work is characterized by high technical ability in the modeling as in the carving of the marble. He was elected associate of the National Academy in 1909. In 1915 he was awarded a gold medal at the Panama-Pacific Exposition.—His younger brother, FURIO (1869-), who also studied at the San Luca Academy in Rome and came to the United States, is known for delicately carved reliefs and statues, such as "The Young

Mother" (1908). At the Panama-Pacific Exposition he received a silver medal.

PICCOLO (It., small). A flute of small dimensions, having the same compass as the ordinary flute, while the notes all sound an octave higher than their notation. In joyous as well as violent passages this instrument is sometimes very effective in an orchestra. The piccolo is usually made in three keys, C, D \flat , and E \flat , the latter two being used almost exclusively in military music. Piccolo is also the name of an organ stop. See FLUTE.

PICCOLOMINI, pik'kò-lòm'i-nè. The name of an old Italian family whose ancestors settled at Rome, afterward removed to Siena, and finally obtained the Duchy of Amalfi. Its most eminent member was ÆNEAS SYLVIVS PICCOLOMINI, who became Pope in 1458. (See PIUS II.) The family also gave several cardinals to the Church, and another Pope, Pius III (q.v.).—**OTTA VIO PICCOLOMINI** (1599-1656), first Duke of Amalfi and fifth in direct descent from Pope Pius II, was a distinguished general in the Thirty Years' War on the Catholic side. He was born in Florence and first entered the Spanish military service, and then as captain in a Florentine cavalry regiment aided Emperor Ferdinand II against the Bohemians. He won distinction as a cavalry leader, served under Wallenstein, and at Lützen (1632) commanded the regiment of cuirassiers that met the last charge of Gustavus Adolphus. Wallenstein confided to him his secret designs against the Emperor; Piccolomini, however, communicated these designs to the Emperor, and after Wallenstein's assassination (1634) received as a reward for his fidelity a part of his estates. He took part in the battle of Nördlingen (1634), and in the following year was sent with a large force to aid the Spaniards in the Netherlands, where the French and Dutch were carrying all before them. Piccolomini speedily drove out the French, but his success against the Dutch was not so marked. In 1640 he was summoned to stay the Swedes, under Baner, who were threatening the hereditary possessions of Austria. He succeeded in checking the invaders in Bohemia and the Palatinate, but was badly beaten, along with the Archduke Leopold, in 1642 at Leipzig by Torstenson. He was now sent to the Netherlands to take command of the Spanish troops, and though the prestige of the Spanish infantry was destroyed by the Duke d'Enghien (the future Condé) at Rocroi (May 19, 1643), Piccolomini was again successful against both the French and the Dutch till 1648, when he was anew summoned to Germany to encounter the victorious Swedes. The Peace of Westphalia put an end to the Thirty Years' War soon after. Piccolomini had now attained the rank of field marshal. In 1650 he was raised to the dignity of a prince of the Empire. The King of Spain conferred upon him the Order of the Golden Fleece and bestowed upon him the Duchy of Amalfi, which had previously belonged to his family. With his son, Max, Piccolomini figures prominently in Schiller's *Wallenstein*. Consult C. M. Ady, *Pius II (Æneas Silvius Piccolomini), the Humanist Pope* (London, 1913).

PICCOLOMINI, DIE. The second play in Schiller's *Wallenstein* trilogy, produced in 1799.

PICENUM. One of the ancient divisions of middle Italy, extending along the Adriatic from the *Æsis* (now Esino) to below the *Vomans* (now *Vomano*) River, and bounded on the west

by Umbria, Sabinum, and Vestinum. It was anciently inhabited by the Umbrians, who were conquered by the Sabines, under whom the name Picenum was acquired. In 268 B.C. the district was reduced by the Romans to the condition of a dependency. Its territory was divided up among Latin-speaking settlers in 232 B.C. by the Lex Flaminia, and many of its inhabitants colonized in the town of Picentia. In Asculum, the old capital of Picenum, in 91 B.C., occurred the outbreak of the War of the Italian Confederacy against Rome. (See SOCIAL WAR.) Under Augustus Picenum formed the fifth political region of Italy.

PICHEGRU, pèsh'gru', CHARLES (1761-1804). A French revolutionary general. He was born Feb. 16, 1761, at Arbois in the Department of Jura, and was educated at the college of his native town. He subsequently attended the military academy at Brienne, where he taught mathematics and had Bonaparte as one of his pupils. He entered an artillery regiment in 1783 and was a lieutenant when the Revolution broke out. Pichegru became an ardent republican, joined the Army of the Rhine, and by his soldierly qualities soon attracted general attention and earned rapid promotion. In 1793 he became general of division and commander of the Army of the Rhine, and, in conjunction with Hoche, repeatedly defeated the Austrians and established himself securely in the Palatinate. After the arrest of Hoche his success at the head of the combined Rhine and Moselle armies was not less decided. The rapidity and boldness of his maneuvers when in command of the Army of the North, in 1794, again disconcerted the allies, and they were compelled to retreat beyond the Meuse. Pichegru completed the conquest of Holland in 1795 and ended a glorious campaign by organizing the Batavian Republic. He next visited Paris, and while there suppressed an insurrection in the suburbs of the city (April 1, 1795); but soon afterward went to take command of the Army of the Rhine, and for some time displayed his usual skill and energy, crossing the river in the face of the enemy and capturing the fortress of Mannheim. But the state of affairs at Paris, combined with the flattering promises and bribes held out to him by the Prince of Condé, converted Pichegru into a secret partisan of the Bourbons. His inactivity, though prearranged with the Austrian generals, was not suspected till he suffered himself to be defeated at Heidelberg and retreated, leaving Jourdan (q.v.) without support, thus compelling the latter also to retire. The suspicions of the Directory were confirmed by the seizure of Pichegru's correspondence, and he was immediately superseded by Moreau (q.v.). He then retired to his native town, where he lived till 1797, when he was elected one of the Council of Five Hundred. He soon became its president; but still continuing his intrigues with the Bourbons, he was arrested and subsequently transported to Cayenne, but escaped in June, 1798, to England. He entered heart and soul into the Bourbon conspiracy along with Cadoudal (q.v.), the two Polignacs, and others, the primary object of which was the assassination of the First Consul. The conspirators secretly reached Paris, and there in 1804 Pichegru attempted to persuade Moreau, who was on bad terms with Napoleon, to join them, but without success. But the plans of the conspirators were soon known to the police,

and an intimate friend of Pichegru, with whom he resided, sold the secret of his retreat to the police. Pichegru was suddenly arrested and taken to the Temple prison, Feb. 28, 1804. On April 6 he was found dead in his bed. The Royalists endeavored to fasten a charge of secret assassination on Napoleon, but it was generally, and probably correctly, believed that Pichegru strangled himself. Consult: Comte de Montgaillard, *Mémoire concernant la trahison de Pichegru* (Paris, 1804); De Vouziers, *Pichegru, général en chef de l'armée française: sa vie* (ib., 1870); E. Daudet, *La conjuration de Pichegru*, etc. (ib., 1901); Guillaumin, *Les derniers républicains: Pichegru, Simon, Delmas, Monnier* (ib., 1905); G. Caudrillier, *La trahison de Pichegru et les intrigues royalistes dans l'Est avant fructidor* (ib., 1908), containing a bibliography.

PICHICIAGO, pích'i-sé-á'gô. See ARMADILLO, and Plate of ANTEATERS.

PICHINCHA, pé-chén'chá. A volcano of the western range of the Andes in Ecuador, situated a few miles northwest of Quito (Map: Ecuador, B 4). It is an irregular mass of peaks, the highest of which, Huahua-Pichincha, has an altitude of 15,918 feet. Its crater is over 2000 feet deep; it is dormant, there having been no great eruption since 1660. On its slopes, on May 24, 1822, was fought the battle which secured the independence of the Republic.

PICHLER, pik'lér, ADOLF VON (1819-1900) (Ritter von Rautenkar). An Austrian poet and naturalist. He was born at Erl in Tirol, studied at Innsbruck and Vienna, published his first volume of poems in 1846, and in 1848 as an Austrian volunteer in the Italian campaign fought with great bravery. In 1867 he was appointed professor of mineralogy and geology in the University of Innsbruck. He wrote on the geology of the Alps and of Tirol, but is better known as the Tyrolese poet, author of *Fruhlieder aus Tirol* (1846), *In Lieb' und Hass* (1869; 3d ed., 1900), *Vorwinter* (1885), and *Spätfürchte* (1896), as well as tales, as, e.g., *Der Einsiedler* (1896), and dramas, among which may be mentioned *Die Tarquinier* (1860; 2d ed., 1898) and *Rodrigo* (1862). He also wrote *Ueber das Drama des Mittelalters in Tirol* (1850), *Zur Geognosie der Alpen* (1867), and other scientific works. Valuable autobiographic material is contained in his *Aus den März- und Oktobertagen zu Wien, 1848* (1850), and *Aus dem wälsch-tirolischen Kriege* (1849). His collected works appeared in six volumes (Leipzig, 1897-98); also in 17 volumes (Munich and Leipzig, 1904-08; 4th ed., 1909). Consult Prem, *Adolf von Pichler, der Dichter und Mensch* (Innsbruck, 1901), and R. M. Werner, in *Vollendete und Ringende* (Minden, 1900).

PICHLER, KABOLINE (1769-1843). An Austrian novelist, born (von Greiner) in Vienna. Her first novels, *Gleichnisse* (1800), *Oliver* (1802), *Leonore* (1804), *Ruth* (1805), possessed slight merit; *Agathokles* (3 vols., 1808), her best work, was meant to disprove the heresies of Gibbon's *Decline and Fall of the Roman Empire*. Succeeding novels were chiefly historical in matter, patriotic in purpose, and diffuse in style; e.g., *Die Grafen von Hohenburg* (1811); *Die Belagerung Wiens* (1824); *Die Schweden in Prag* (1827); *Henriette von England* (1832). She also wrote society stories, *Frauenwürde* (1808), *Die Nebenbuhler* (1821), *Zeithilder* (1840), which, like her autobiographical *Denk-*

würdigkeiten (1844), are wearisome and now seldom read; and some dramas, e.g., *Germanicus*. Her works are in 60 volumes (Vienna, 1820-44).

PICHON, pē'shōn', STÉPHEN (JEAN MARIE) (1857-). A French diplomat and cabinet officer, born at Arnay-le-Duc. He was educated at the University of Paris, studied medicine, but soon turned to journalism and in 1880 joined the staff of Clemenceau's journal *La Justice*. He entered Paris politics, becoming a member of the municipal council in 1882 and serving several times as secretary of that body. In 1885 he was elected to the Chamber of Deputies and in 1889-90 was its secretary. After 1894 he was successively Minister to Hayti, to Brazil, and at Peking, where he was stationed during the Boxer troubles, and to Tunis. Pichon was elected Senator from Jura in 1905, in the next year he received the portfolio of Foreign Affairs in Clemenceau's cabinet, and he held the same post under Briand in 1910-11 and under Barthou in 1913.

PICU'RIC ACID. See LAURIC ACID.

PICIDÆ, pī'sī-dē (Neo-Lat. nom. pl., from Lat. *picus*, woodpecker). The family of woodpeckers. See WOODPECKER.

PICK, BERNHARD (1842-). An American Lutheran clergyman and religious writer, born at Kempen in Prussia. He studied in Berlin and at the Union Theological Seminary, New York. After holding Presbyterian pastorates from 1868 to 1881 he joined the Lutheran denomination and subsequently occupied pulpits in Albany, N. Y. (1895-1903), and, from 1905, in Newark, N. J. Besides contributions to the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, the *Cyclopædia of Religious Knowledge*, and many periodicals, his publications include: *Luther as a Hymnist* (1875); *Life of Jesus according to Extra-Canonical Sources* (1887); *The Talmud: What It Is and What It Says about Jesus and the Christians* (1890); *Historical Sketch of the Jews since their Return from Babylon* (1892); *The Extra-Canonical Life of Christ* (1903); *Hymns and Poetry of the Eastern Church* (1908); *Apocryphal Acts of Paul, Peter, John, Andrew, and Thomas* (1909); *Translations of the Bible* (1913).

PICK'ARD, SAMUEL THOMAS (1828-1915). An American journalist and biographer, born at Rowley, Mass. From 1852 to 1894 he was editor and proprietor of the Portland (Me.) *Transcript*. He became the literary executor of John Greenleaf Whittier, whose niece he married, and trustee of the Whittier Homestead and Birthplace. Pickard published, besides many monographs, literary articles, and reviews, *Haithorne's First Diary* (1897); *Whittier as a Politician* (1901); *Whittier Land* (1904); *Life and Letters of John Greenleaf Whittier* (1907).

PICKELHERING, pīk'el-hā'ring. A stock fool in the drama. The name was probably first assumed in the early part of the seventeenth century by Robert Reynolds, who traveled through Germany with a company of strolling comedians.

PICK'ENS, ANDREW (1739-1817). An American soldier, born at Paxton, Pa. He removed with his parents to the Waxhaw settlement, S. C., in 1752, and fought in the Cherokee War in 1761 as a volunteer. At the beginning of the Revolutionary War he became captain of a militia company, and by successive promotions soon

attained the rank of brigadier general of South Carolina troops, gaining great distinction as a partisan leader. In 1779 he defeated a superior force of Loyalists under General Boyd at Kettle Creek, participated on June 20 in the battle of Stono Ferry, and defeated the Cherokees at Tomassees. He commanded the militia at the battle of Cowpens, Jan. 17, 1781, twice rallying them after they had been driven back, and for his gallantry received a sword from Congress. At the battle of Eutaw Springs, Sept. 8, 1781, he was in command of the Carolina militia, and in 1782 forced the Cherokees to relinquish their claim to a large tract of land now included in the State of Georgia. After the war he was a member of the South Carolina Legislature from 1783 to 1794, sat in Congress in 1793-95, was a member of the State Constitutional Convention, became major general of militia in 1795, and was again in the Legislature in 1801 and 1812. He was commissioner on many occasions to treat with the Indians.—His son, ANDREW, a lawyer, was Governor of South Carolina in 1816-18 and died in Mississippi in 1838. Consult Edward McCrady, *South Carolina in the Revolution* (2 vols., New York, 1902).

PICKENS, FORT. See FORT PICKENS.

PICKENS, FRANCIS WILKINSON (1805-69). An American statesman and diplomat, born at Togadoo, St. Paul's Parish, S. C. He studied at South Carolina College, was admitted to the bar in 1829, and three years afterward was elected to the State Legislature, where he soon became prominent as an advocate of nullification and the doctrine of extreme State rights. From 1834 until 1844 he was a member of Congress, in 1850-51 a delegate to the Nashville Southern Convention, in 1854 presiding officer of the South Carolina State Convention, and in 1856 a delegate to the General Democratic Convention in Cincinnati. The next year he was appointed United States Minister to Russia, but returned to America in 1860, and soon afterward was elected Governor of South Carolina. He zealously supported the secession movement, and immediately after the passage of the ordinance by the Charleston Convention began to organize an independent government. To this end he demanded the surrender of all Federal property within the borders of the State, and when Major Anderson refused to give up Fort Sumter, began to erect the batteries which afterward, under the orders of the Confederate government, caused its reduction.

PICK'EREL (double dim. of *pike*). One of the smaller members of the pike family, Lucidae. The Eastern, pond, or grass pickerel, jack, or green pike (*Lucius reticulatus*) is common everywhere east and south of the Alleghany Mountains. In Tennessee and Arkansas it reaches a length of 24 inches and is golden green marked with numerous dark lines and streaks, which are mostly horizontal and by their junction with one another produce a reticulated appearance. The banded pickerel (*Lucius americanus*), of the coast streams from Massachusetts to Florida, is 12 inches long and dark green, with about 20 blackish curved bars on the sides. The little pickerel (*Lucius vermiculatus*) occurs throughout the Mississippi valley, is 12 inches long and very variable in color, with an irregular network of fine curving streaks on the sides. The common pike is also frequently called pickerel. The habits and mode of catching are the same as in the case of the pike (q.v.). See

Plate of NEEDLEFISH, PIKE, ETC.; and Colored Plate of AMERICAN GAME FISHES, accompanying article Trout.

PICKEREL FROG. A small light-brown frog (*Rana palustris*) with dark square or oblong brown blotches in two rows on its back, and the head marked by a dark line which runs from the nostril to the eye. This frog dwells in the eastern United States, especially in mountainous parts, and occurs mainly about springs.

PICKERING, CHARLES (1805-78). An American naturalist, grandson of Col. Timothy Pickering, born at Starucca Creek, Pa. He graduated at Harvard in 1823 and at the Medical School three years later. After practicing for some years he was, in 1838, appointed naturalist of the United States Exploring Expedition under the command of Lieut. Charles Wilkes (q.v.). In 1843 he visited Egypt, Arabia, East Africa, and India. He published: *The Races of Man and Their Geographical Distribution* (1848); *The Geographical Distribution of Animals and Plants* (1854-61); *The Chronological History of Plants: Man's Record of his own Existence Illustrated through their Names, Uses, and Companionship* (1879).

PICKERING, EDWARD CHARLES (1846-). An American astronomer, brother of W. H. Pickering, born in Boston. He graduated at the Lawrence Scientific School, Harvard, in 1865, and for the next two years was instructor of mathematics there. From 1867 until 1876 he was Thayer professor of physics at the Massachusetts Institute of Technology, but in the latter year he returned to Harvard as professor of astronomy and director of the observatory. At the Institute of Technology in 1869 he established the first physical laboratory for general instruction in the United States, and later, in connection with his work at Harvard, established an important observatory at Arequipa in Peru. He devoted particular attention to the study of light and the spectra of the stars and published the results of his observations in the *Annals of the Harvard Observatory*. In 1906 Pickering became president of the Astronomical and Astrophysical Society of America. Nearly all the important scientific bodies of Europe elected him to membership or honorary membership. For his work on astronomical physics he received the Henry Draper medal, and he was awarded the Rumford (1891) and Bruce (1908) gold medals, and two others by the Royal Astronomical Society, London. In 1911 he was admitted to the German Order "Pour le Mérite." Heidelberg and Victoria University, Manchester, as well as many American universities, gave him honorary degrees. He published *Elements of Physical Manipulation* (2 vols., 1873-76).

PICKERING, JOHN (1777-1846). An American linguist and lexicographer, son of Timothy Pickering, born in Salem, Mass. He graduated at Harvard in 1796, studied law with Edward Tilgham in Philadelphia, was Secretary of Legation in Lisbon until 1799, and then became private secretary to Rufus King, United States Minister to England. He practiced law in Salem, Mass., from 1801 to 1827, was city solicitor of Boston (1827-46), and during his service in the State Legislature took a prominent part in revising the Massachusetts General Statutes. He was president of the American Academy of Sciences, first president of the American Oriental Society, an able linguist, and, like his father,

particularly interested in the languages of the North American Indians. He wrote an *Essay on the Pronunciation of the Greek Language* (Cambridge, 1818); *A Uniform Orthography for the Indian Languages* (1820); *Remarks on the Indian Languages of North America* (1836); *Vocabulary of Words and Phrases, Supposed to Be Peculiar to the United States* (1816); *a Greek and English Lexicon* (1826; 3d ed., 1846); as well as many monographs on ancient and international law. Consult the biography by his daughter, Mary Orne Pickering (Boston, 1887).

PICKERING, TIMOTHY (1745-1829). An American statesman. He was born at Salem, Mass., July 17, 1745, graduated at Harvard in 1763, and was admitted to the bar in 1768. In 1773 he drafted for the town of Salem a paper entitled *State of the Rights of the Colonists* and in the following year the memorial of the citizens of Salem to General Gage in regard to the Boston Port Bill. In 1775 he published *An Easy Plan of Discipline for a Militia*, which was adopted in the following year by the General Court of Massachusetts for use by the militia. In 1776 he joined the Revolutionary army and led an Essex County regiment to Tarrytown, N. Y. In the following year he took part in the battles of Brandywine and Germantown and was appointed a member of the Congressional Board of War, serving until its abolition. In 1780 he was appointed quartermaster general of the army and retained the office until its abolition in 1785. Upon his retirement from the army he engaged in business in Philadelphia, but two years later removed to the Wyoming valley, and became involved in the disturbances of that region, where he was instrumental in maintaining order and quiet. He settled the territorial disputes between Pennsylvania and the inhabitants of the Wyoming valley and organized Luzerne County, which he represented in the Pennsylvania Constitutional Convention of 1789. In 1790 he was commissioned by President Washington to negotiate a treaty with the Six Nations, which he did successfully, and later performed a similar service with the Indians of the Northwest. In 1791 Colonel Pickering was appointed Postmaster-General of the United States, which office he held until 1795, when he was appointed Secretary of War. Pickering signalized his administration by establishing a military school at West Point and by supervising the construction of the frigates *Constitution*, *United States*, and *Constellation*. Upon the resignation of Edmund Randolph near the end of 1795, Colonel Pickering was appointed Secretary of State, which office he held during the remainder of Washington's term and through the greater part of Adams's administration. In 1800 he was abruptly removed on account of a serious disagreement with the President growing out of the difficulties with France over the X Y Z correspondence (q.v.). He had used all his influence to hamper the President and to advance the political interests of Alexander Hamilton. He then retired to his uncleared lands in what is now Susquehanna Co., Pa., but was in poor circumstances, and some of his Massachusetts friends prevailed upon him to return to his native State, where in 1802 he became Chief Justice of the Court of Common Pleas. In the following year he was elected to the United States Senate, where he served until 1811. As a member of the House of Representatives he served from 1813

until 1817, when he refused a renomination and again retired to private life. He was an ardent Federalist, a prominent member of the group known as the Essex Junto, and was strongly opposed to the Louisiana Purchase and the War of 1812. He wrote numerous political papers, including a *Review of the Correspondence between John Adams and William Cunningham*. A biography of Colonel Pickering in four volumes was published by Octavius Pickering and C. W. Upham (Boston, 1867-73). In the library of the Massachusetts Historical Society at Boston are 62 manuscript volumes of the Pickering papers, an index to which was published in the *Collections of the Society*, 6th series, vol. viii (Boston, 1896).

PICKERING, WILLIAM (1796-1854). An English publisher. After serving for 10 years in a Quaker publishing house in Cornhill, London, he opened a bookshop of his own in Lincoln's Inn Fields (1820). Adding publishing to the business, he subsequently moved to Chancery Lane (1824) and to Piccadilly (1842). For printing he employed, up to 1829, the Chiswick Press. Subsequently his printing was done by Charles Whittingham, a nephew of the Charles Whittingham of the Chiswick Press. About 1830 he adopted the trade-mark of Aldus, the famous Italian printer—an anchor entwined with a dolphin, to which was added the motto, *Aldi Discip. Ang.* Among his notable undertakings were the "Diamond Classics" (a series of delicate volumes in 48mo and 32mo, issued between 1821 and 1831) and reprints of different versions of the Book of Common Prayer between 1549 and 1662 (6 vols., 1844), the typography of which has probably never been surpassed. Among his sumptuous publications may be cited Walton's *Compleat Angler*, illustrated by Stothard and Inskipp (2 vols., 1836). He also projected the Aldine edition of English poets. After his death the business was carried on by his son, BASIL MONTAGUE PICKERING (1836-78), who, among several reprints, issued a facsimile of the first edition of *Paradise Lost*. In 1878 the firm came to an end.

PICKERING, WILLIAM HENRY (1858-). An American astronomer, brother of Edward C. Pickering. He was born in Boston and in 1879 graduated from Massachusetts Institute of Technology, where he was an assistant and instructor in physics in 1880-87. In the latter year he was appointed assistant professor of astronomy at the Harvard Observatory. Pickering led eclipse expeditions to Colorado (1878), Grenada, W. I. (1886), California (1889), Chile (1893), and Georgia (1900); discovered Phæbe, the ninth satellite of Saturn, in 1899, and later Themis, the tenth satellite; made lunar observations in California in 1904; and visited Hawaii (1905) and the Azores (1907). He received the Lalande prize in 1905 and the Janssen medal in 1909. His publications include: *Guide to Mount Washington Range* (1882); *The Moon* (1903); *Lunar and Hawaiian Physical Features Compared* (1906); and contributions to the *Annals* of Harvard Observatory.

PICK'ET (OF. *piquet*, *piquet*, Fr. *piquet*, peg, dim. of OF. *pique*, *pioque*, Fr. *pique*, pike, probably from Lat. *spica*, point, ear of grain, tuft of a plant, pin). In a military sense the word "picket" has several meanings. 1. A *picket* is the name of one of the classes of small detachments comprised under the more general term "outguards," which form one of the sub-

divisions of outposts (q.v.). Briefly a picket is a group of men consisting of two or more squads (eight men to the squad), but ordinarily not exceeding half a company, posted on the *line of observation* to cover a given sector. It furnishes patrols and one or more sentinels, double sentinels, sentry squads, or Cossack posts, for observation in its own sector. (Consult *Field Service Regulations, United States Army*, 1914.) 2. A *picket line* is a secured line to which animals are tethered in camp or garrison. There are two kinds, *ground* and *high*. A ground line is stretched on the ground, attached at its ends and at intervals of about 30 yards to stakes or some other form of holdfast. Such is the picket line used in the United States service for cavalry and pack trains in the field. A high line is stretched above the ground to trees, stakes, or to the wheels of wagons and artillery carriages. This type of picket line is used by the United States field artillery. (Consult *Engineer Field Manual, United States Army*, Washington, 1914.) 3. A *picket pin* is a short iron pin, driven into the ground, to which is attached a lariat by means of which the individual cavalryman tethers his horse in the field. The picket pin and lariat form a part of the individual horse equipment and are carried on the saddle. 4. In field fortification *pickets* are wooden stakes, about 3 feet long, about which are woven brush to form brush hurdles, used as a revetting material. 5. Formerly in the British army the word "picket" was applied to a *military punishment*, now strictly forbidden, in which the weight of the body was sustained on one foot resting on a picket with a blunted point. See ADVANCE GUARD; OUTPOST; PATROL.

PICK'ETING. In labor conflicts, the practice pursued by trade-unions of stationing outposts near the place of employment where a strike is in progress, for the purpose of dissuading workmen not affiliated with the union from taking service with the employer against whom the contest is being waged. In theory a matter of persuasion, picketing, in strikes where feeling runs high, is apt to assume the form of intimidation against nonunion workmen, and as such has come within the cognizance of the police, who, as a rule, have been able to prevent the effective execution of picketing duty by the exercise of the authority vested in them to prevent open disorder and loitering in the public highways. Legally the question is a mooted one, and the real point in most cases that appear before the courts is one of fact as to whether the union watchers have overstepped their right of exercising moral persuasion and have resorted to force. See STRIKE.

PICK'ETT, GEORGE EDWARD (1825-75). An American soldier, born in Richmond, Va. He graduated at West Point in 1846, served in the Mexican War, and was brevetted first lieutenant for gallantry at Contreras and Churubusco and captain for his conduct at Chapultepec. He became first lieutenant in 1849 and captain in 1855. In 1856, while serving in Washington Territory, he occupied San Juan Island and prevented the landing of British troops. The dispute over the northwest boundary was in progress, and Sir James Douglas (q.v.), the Governor of Vancouver Island, had sent warships to eject the Americans; an engagement was averted only by the arrival of the British admiral, who refused to resort to force. He

resigned from the Federal army June 25, 1861, and became major of artillery in the Confederate army. On July 23 he was made colonel in the provisional army and was assigned to command in the lower Rappahannock. On Feb. 28, 1862, he was appointed brigadier general in Longstreet's division of Joseph E. Johnston's army, then known as the Army of the Potomac, but later as the Army of Northern Virginia. At Seven Pines he held his ground stubbornly, though outnumbered. He was seriously wounded at Gaines's Mill and on his recovery was made major general, in October, 1862. At Fredericksburg he held the centre of the Confederate line. At Gettysburg his division reached the field on the morning of the third day, July 3, and formed the centre of the attacking line in the famous assault on Cemetery Ridge. (See GETTYSBURG.) In September, 1863, General Pickett received command of the Department of North Carolina and made an unsuccessful demonstration against Newbern in January, 1864. When he returned to Virginia his division recaptured the Confederate lines at Drewry's Bluff in June. He was sent to Lynchburg to oppose Sheridan's cavalry in March, 1865, and was badly defeated at Dinwiddie Court House and Five Forks, but rallied his men and checked the pursuit. After the close of the war he went to Richmond, where he remained for the rest of his life. Consult L. C. Pickett, *Pickett and his Men* (Washington, 1905).

PICKLES (probably from Dutch and LG. *pekkel*, *pickel*, Mod. Ger. *pokel*, pickle, brine). Though the term "pickled" is applied to animal substances, such as beef, pork, and fish preserved in salt, yet pickles are generally understood to be the various kinds of fruits or vegetables preserved in vinegar. Pickle making varies both as a domestic and as a commercial process. A common process is first to wash the articles intended for pickles in clean cold water and afterward to soak them for a few days in a strong solution of salt in water. They are next taken out, dried in a clean cloth, or drained, and then placed in the vessels intended to hold them, a few peppercorns, or any other suitable spice, being sprinkled in from time to time. When the vessel is so far filled that it will hold no more, boiling vinegar is poured in until it is full, and it is then tightly covered. Pickles are also made by allowing the vegetable to ferment in salt. Dill pickles are made in this way with dill tops to be added as a flavor. Except in the case of green walnuts and one or two other pickles, extreme softness is objectionable. When the materials to be pickled are naturally green, as in the case of gherkins or small cucumbers, French beans, etc., it is considered very desirable to preserve their color as much as possible; and it is sometimes very successfully accomplished by steeping vine, cabbage, spinach, or parsley leaves in the vinegar, whereby their color is imparted to the pickles through the vinegar. It has been a common custom to green pickles by cooking them in copper vessels or by the addition of a small amount of a copper salt. The passage of national and State pure-food laws has very greatly lessened this custom in the United States. In domestic pickle making the same end is accomplished by covering the pickles with green grape leaves or some other leaves. Many fruits are preserved by pickling, in which case no salt is used and sugar and common spices are added to

the vinegar. Such are termed sweet pickles. Pears, plums, peaches, currants, cucumbers, and blackberries are particularly palatable when prepared in this way. The principal vegetables commonly preserved by pickling are cauliflowers, cabbage, cucumbers, gherkins, onions, tomatoes (green), young muskmelons (used for so-called mangoes), mushrooms, and nasturtium seeds. *Piccalilli*, or Indian pickle, is a mixture of various vegetables, as cucumbers, onions, cauliflowers, and of spices, pickled together. *Chowchow* is a mixed pickle to which mustard is added. Chutney is a famous pickle of East India origin, containing many tropical fruits highly spiced and seasoned. Pickles contain much water, sometimes more than 90 per cent, and consequently have a low food value. They are used chiefly as condiments or as delicacies. See FOOD, PRESERVATION OF.

PICKLE WORM, or PICKLE MOTH. A moth of the family Pyralidæ (*Diaphana nitidalis*), which occurs abundantly throughout the southern and western United States and lives in the larval state in cucumbers, boring into them and destroying them when about half grown, or at about the stage when they are preferably used for pickles, whence the popular name. It also feeds upon other cucurbitaceous plants, such as the squash, cantaloupe, and melon. The early generation of this insect feeds upon the leaves of the same plants, and there is little doubt that by carefully spraying them with arsenicals before the fruit is grown the insect may be held in check.

PICK'NELL, WILLIAM LAMB (1854-97). An American landscape and marine painter. He was born at Hinesburg, Vt, and studied under George Inness at Rome, Gérôme at Paris, and Robert Wylie in Brittany. He returned to America in 1882, but passed his winters in England and southern France. He was a member of the Society of American Artists and of the Society of British Artists, an Associate of the National Academy of Design, and received medals at Boston (1881 and 1888). His work is realistic and unaffected, with a fine feeling for line, brilliant light effects, often attained by use of the palette knife, and rich color, though he also succeeded well with the shimmering mist in his gray marines. His chief works include: "Route de Concarneau" (1880) and "En Provence," both in the Corcoran Gallery, Washington, "Borders of the Marsh" (1880), Academy of Fine Arts, Philadelphia; "Coast of Ipswich" (1882) and "Morning on the Loire," both in the Boston Museum; "Bleak December" (1887) and "Borders of the Loing," both in the Metropolitan Museum, New York; "Wintry March," Walker Gallery, Liverpool; "Morning on the Mediterranean," Luxembourg, Paris; "Toiler of the Sea," Carnegie Institute, Pittsburgh.

PICK'WICK CLUB, THE POSTHUMOUS PAPERS OF THE. A novel by Charles Dickens (1837). It was undertaken to accompany a set of comic sketches by Seymour, appearing as a serial in 1836 and 1837, and established Dickens's literary success. It is a work of humor throughout, giving rather loosely connected accounts of comical characters in many walks of life, such as Sam Weller, Alfred Jingle, Mrs. Bardell, Mr. and Mrs. Leo Hunter, linked together by the adventures of the amiable Mr Pickwick, chairman of the Club of Solemn Stupidity.

PICO, pē'kō. One of the Azores Islands (q.v.), belonging to the central group (Map: Portugal, A 4). It is 36 miles long and 4 to 10 miles wide, with an area of 173 square miles. It is traversed by a volcanic ridge, which rises 7613 feet high in the peak (Pico), whence the name of the island. The chief product is wine. Pop., 1900, 16,826; 1911, 15,138.

PICO DELLA MIRANDOLA, dēl'la mē-rān'-dō-lā, GIOVANNI, COUNT (1463-94). An Italian philosopher and theologian. He was born Feb. 24, 1463, the son of the sovereign prince of Mirandola and Concordia. He studied at the University of Bologna and afterward visited the principal schools of Italy and France. At the age of 23 he returned to Rome and immediately sought an opportunity of showing his learning by publicly posting up no fewer than 900 theses or propositions in logic, ethics, physics, mathematics, theology, science, and cabalistic magic, drawn from Latin, Greek, Jewish, and Arabic writers, offering to maintain an argument on each against all the scholars of Europe and undertaking to pay the expenses of those who came from a distance. Pico presumptuously entitled his theses *De Omni Re Scibili* (On Everything that can be Known). Pope Innocent VIII refused to allow Pico to carry on this discussion inasmuch as some of his theses were deemed heretical. But Alexander VI cleared him of the charge of heresy. He died Nov. 17, 1494, at the early age of 31. A complete edition of his works was published at Bologna in 1496; it has since been frequently reprinted. In philosophy Pico was a Neoplatonist, though his thoughts were tinged with cabalism. His collected works were published in Basel (1601). A *Platonick Discourse upon Love*, first published in English translation in 1651, has been reprinted (Boston, 1914). Consult: Georg Dreydorff, *Das System des Johannes Pico von Mirandola und Concordia* (Marburg, 1858); G. F. Pico, *Giovanni Pico della Mirandola: His Life by his Nephew*, translated by Sir Thomas More, and edited by J. M. Rigg (London, 1890); Massetani, *La filosofia cabalistica di G. Pico della Mirandola* (Empoli, 1897); Walter Pater, *The Renaissance: Studies in Art and Poetry* (Library ed., London, 1910).

PICOT, pē'kō', AUGUSTE EMILE (1844-). A French scholar, historian, and bibliographer, born in Paris. He was secretary of Prince Charles of Rumania from 1866 to 1867, Vice Consul at Temesvár (1869-72), and then became instructor (1875) and professor (1878) at the Ecole des Langues Orientales Vivantes, Paris. In 1879 he was elected honorary member of the Rumanian Academy, in 1892 honorary member of the Academy of Serbia, and in 1897 member of the Institute of France. In 1913 his friends and pupils presented him two volumes of *Mélanges* on the occasion of his retirement from active teaching. The first volume of this work contains a complete bibliography of his publications. A prolific writer, especially on the history of Rumania and early French literature, Picot published: *Les Serbes de Hongrie* (1873-74), which aroused considerable discussion at the time; *Alexandre le Bon, prince de Moldavie* (1882), with Bengesco; *Chants populaires des Roumains de Serbie* (1889); *Bibliographie cornélienne* (1876); *Catalogue de la bibliothèque de feu M. le baron James de Rothschild* (4 vols., 1884-1912); *Pierre Gringore* (1877); *La sottie en France* (1878);

Documents pour servir à l'histoire de l'ancien théâtre français (3 vols., 1878-82); *Les français italianisants du XVIe siècle* (2 vols., 1906); *Nouveau recueil de farces* (1880), with K. Nyrop; *Recueil général des sotties* (3 vols., 1902-12); *Œuvres poétiques de Guillaume Aleais* (3 vols., 1896-1908), with A. Piaget; *Le mystère du Viel Testament* (6 vols., 1878-91), with J. de Rothschild; *Le jardin de plaisance et fleur de rhétorique* (1910); *Recueil manuscrit de poésies exécutés pour Jacques Le Lieur vers 1520* (1912); *Notice sur Jacques Le Lieur* (1913).

PICOT, AUGUSTE HENRI MARIE. See DAM-PIERRE, A. H. M. P., MARQUIS DE.

PICOT, GEORGES (1838-1909). A French jurist and historian. He was born in Paris, studied law, and in 1865 was appointed judge at the Seine tribunal. In 1877 he received a post in the Ministry of Justice, from which he retired when Grévy became President, to become editor of *Le Parlement*, the organ of the Left Centre. In 1878 he was elected to succeed Thiers in the Academy of Moral and Political Sciences and in 1896 became its perpetual secretary. Among Picot's writings the chief are: *Recherches sur la mise en liberté sans caution* (1863); *Les élections aux Etats généraux dans les provinces, 1302-1614* (1874); *Histoire des Etats généraux* (1872; 2d ed., 1888), his best work, twice winner of the Gobert prize; *La réforme judiciaire* (1881); *Un devoir social et les logements d'ouvriers* (1885); *Pacification religieuse* (1892); *Décentralisation et ses différents aspects* (1897); *Documents relatifs aux Etats généraux et assemblées réunies sous Philippe le Bel* (1901); *L'Institut de France* (1907), in collaboration with the secretaries of the four other academies.

PICPUS (pēk'pus') **SOCIETY**. The name commonly used for a religious community in the Roman Catholic church officially styled the Congregation of the Sacred Hearts of Jesus and Mary and of the Perpetual Adoration. It was founded in 1805 by Pierre Joseph Coudrin and confirmed by Pius VII in 1817. Its mother house was in the Rue Picpus in Paris, whence the colloquial name. The society was founded to carry on religious and moral education. In 1825 the Catholic work in the Sandwich Islands was given to it, and now it devotes itself to missionary work, especially in eastern Oceania and South America. The mother house is in Louvain, Belgium. In the United States are two houses—at Fairhaven, Mass., and Olema, Cal. Consult: A. Coudrin, *Vie de l'abbé Coudrin* (Paris, 1846); E. Keller, *Les congrégations religieuses en France* (ib., 1880); S. Peron, *Vie de Pierre Marie Joseph Coudrin* (ib., 1900).

PICQUART, pē'kār', MARIE GEORGE (1854-1914). A French general, born at Strassburg. He studied at the military school of Saint-Cyr from 1872 to 1874 and served in Algeria, becoming captain in 1880. In 1896, while Picquart, then a major, was in charge of a bureau in the War Office, a paper came into his hands which bore the signature of Major Esterhazy. It corresponded exactly to the Dreyfus (q.v.) *bordereau*. During the struggle of two factions, one to bring to light and one to suppress the truth, Major Picquart, who had shown an honest desire to get the real facts of the matter, was made a lieutenant colonel and sent away on special service. In 1898, as a witness in the new Dreyfus trial, he stood out against the general staff.

He was then retired and imprisoned for one year. After the final revision of the case he was by special decree named brigadier general in 1906. From this year to 1909 he was Minister of War in the Clemenceau cabinet. Picquart was buried with full military honors.

PICRIC ACID (from Gk. *πικρός*, *pikros*, bitter), or **CABAZOTIC ACID**, $C_6H_3(NO_2)_3OH$. One of the first organic dyes that have been prepared by artificial processes. It is derived from carbolic acid, or phenol, by the action of nitric acid, and is therefore called also trinitrocarbolic acid or *trinitrophenol*. It is best prepared by dissolving carbolic acid in strong sulphuric acid and gradually adding nitric acid; after the violent action has subsided, the mixture is kept for about two hours at a gentle heat, so as to complete the reaction. Picric acid separates out in the form of yellow crystals from the solution thus obtained and may be purified by crystallization from hot water, in which it is moderately soluble. The substance is also formed by the action of nitric acid on many organic products, such as wool, leather, silk, indigo, resins, etc. While it is but sparingly soluble in cold water, it readily dissolves in organic liquids like ordinary alcohol, ether, benzene, etc. It melts at $122.5^\circ C.$ ($252.5^\circ F.$). Its solutions have a strongly bitter taste and stain the skin as well as wool and silk a bright yellow. Formerly picric acid was much used as a dye. Since vegetable fibres are not colored by it, it may be used to detect cotton mixed in with wool. At present picric acid is used extensively for the manufacture of certain explosives. Large exportations from the United States to the European countries at war were made in 1915. The substance itself burns quietly if ignited; but its alkali derivatives, the *picrates* of sodium, potassium, and ammonium, explode when heated, with great violence. It is mostly these derivatives of picric acid that are employed in the manufacture of explosives. The explosives, however, known as *melinite*, *lyddite*, and *shimose*, consist mainly of the free acid (mixed with gun cotton). Formerly the acid was largely used in the manufacture of smokeless powder. Picric acid is said to have been employed also as a substitute for hops in the manufacture of beer. In organic chemistry picric acid is classed with the phenols, being a benzene derivative containing the hydroxyl group (OH). Unlike most other phenols, however, it is more strongly acid than carbonic acid, from the combinations of which (the carbonates) it is capable of taking away the alkali metals to form picrates. These strongly acid properties of picric acid (trinitrophenol) are due to the presence of nitro groups (NO_2) in its molecule.

PICROTOXIN (from Gk. *πικρός*, *pikros*, bitter + *τοξικόν*, *toxikon*, poison, originally that in which arrows were dipped, neut. sing. of *τοξικός*, *toxikos*, relating to a bow, from *τόξον*, *toxos*, bow), either $C_{20}H_{14}O_{13}$ or $C_{18}H_{12}O_{10} \cdot H_2O$. The active poisonous principle contained in the seeds of *Anamirta paniculata*, which grows in the East Indies. It may be obtained from the seeds by extraction with hot alcohol and may be purified by crystallization. It forms colorless needle-like crystals that are very soluble in alcohol and moderately soluble in ether and in chloroform. The substance is extremely poisonous. It is sometimes used externally as a parasiticide and internally to check night sweating in phthisis.

PICTAVI. See **PICTONES**.

PICTET, *pék'tá'*, *Amé* (1857-). A Swiss chemist. He was born at Geneva, where he was educated at the university and where, after studying at Dresden, Bonn, and Paris (D.Sc., 1881), he became instructor in 1882, associate professor in 1894, and full professor in 1899. Pictet is author of the important monograph entitled *La constitution chimique des alcaloïdes végétaux* (1888; 2d ed., 1897; Ger. trans., 1891; Eng. trans. as *The Vegetable Alkaloids with Particular Reference to their Constitution*, 1904).

PICTET, *RAOUL* (1842-). A Swiss physicist and chemist. He was born at Geneva and served as professor in the university of that city. He has devoted himself largely to problems involving the production of low temperatures and the liquefaction and solidification of gases. (See **LIQUEFACTION OF GASES**.) By using extreme cold and pressure he ascertained in 1877 that oxygen, nitrogen, and hydrogen could be liquefied, making this discovery about the same time as Cailletet (q.v.) in Paris, who employed an altogether different method. Pictet is the author of *Mémoire sur la liquéfaction de l'oxygène, la liquéfaction et la solidification de l'hydrogène et sur les théories des changements des corps* (1878); *Synthèse de la chaleur* (1879); *Nouvelles machines frigorifiques basées sur l'emploi de phénomènes physicochimiques* (1895); *Etude critique du matérialisme et du spiritualisme par la physique expérimentale* (1896); *L'Acétylène* (1896); *Le carbide* (1896); *Zur mechanischen Theorie der Explosivstoffe* (1902); *Die Theorie der Apparate zur Herstellung flüssiger Luft mit Entspannung* (1903).

PIC'TON. A town and the county seat of Prince Edward County, Ontario, Canada, situated on the Bay of Quinte and on the Canadian Northern Railway, 103 miles east of Toronto by rail (Map: Ontario, H 5). Steamers connect it with Rochester, Kingston, Belleville, Toronto, and Montreal. It manufactures foundry and machine-shop products, lumber products, canned fruit, butter, boats, and bricks. Pop., 1901, 3698; 1911, 3564.

PICTON, *SIR THOMAS* (1758-1815). A British general, born at Poyston, Pembrokeshire. After going to the West Indies in 1794, he distinguished himself in the taking of St. Lucia and St. Vincent from the French and Trinidad from the Spaniards, and was made military governor of Trinidad in 1797. He restored order there and made many improvements and in 1801 was made brigadier general and civil governor of the island. The severity of his rule caused complaint, and he was superseded in 1803, but was made commandant at Tobago. He was recalled to England to answer charges against his Trinidad administration, but was honorably acquitted and as major general (1808) went to serve at Flushing. He commanded the Third Division under Wellington and was with him throughout the Peninsular campaigns and fought in all the leading battles. He was promoted to the rank of lieutenant general in 1813, after Napoleon's escape from Elba was summoned to join Wellington again in the Netherlands, fought and was wounded at Quatre Bras, and was killed in the battle of Waterloo, while leading his brigade. A monument to him was erected in St. Paul's Cathedral, London.

PIC'TONES, *pik'tón-éz*, or **PICTA'VI**. An ancient tribe in Gaul whose name survives in

Poitiers, the capital of the Department of Vienne. They are mentioned by Cæsar with the Senones, Parisii, Carduci, Turones, Aulerici, and Lemovici in the combination against the Romans organized by Vercingetorix. The chief interest in them is the belief that they were Iberians and probably blood kindred of the Picts in Scotland. On the strength of this connection and a resemblance in physical characteristics, Rhys, an eminent authority, applies the title Ibero-Pictish to the pre-Celtic long-heads in Britain. In Cæsar's time the language of the Pictones was Gaulish, but originally they spoke Iberian. Consult A. H. Keane, *Man: Past and Present* (New York, 1899).

PICTOU, pik-too'. The capital of Pictou County and a port of entry on Pictou Harbor, Northumberland Strait, the north coast of Nova Scotia, Canada, 113 miles north-northeast of Halifax (Map: Nova Scotia, H 5). It is in a fertile and well-cultivated district, with extensive coal mines and quarries of building stone. It is on the Intercolonial Railway, which ships there for Prince Edward Island. The harbor is safe and well equipped. The chief building is the Pictou Academy, founded in 1818. The industrial establishments include manufactories of flour and feed, biscuits, motor boats, tobacco, candy, and woodwork products. The town, which is a seaside resort, dates from 1763 and replaced an Indian village. The United States is represented by a consular agent. Pop., 1901, 3235; 1911, 3179.

PICTS. An ancient people of the Stone age (Long Barrow period), inhabiting the whole of Great Britain. They were dolichocephalic and of rather low stature (5 feet, 5 inches), dark in complexion, and are supposed to have been Iberians or, according to Sergi, long-headed Mediterraneans from Africa speaking Celtic. They were supplanted or incorporated by the succeeding Teutonic invasions in the primitive period of the English nation. The name originated from the custom of the Picts of staining or tattooing the skin. It is pretty generally agreed by scholars that the southern Welsh, the Ffirbolgs (q.v.) of western Ireland, and perhaps the short and dark remnants in Scotland represent survivals of the Picts. The language is not only extinct, but it has left no literature and only scant traces in place names. Concerning their history nothing definite is known until 297 A.D., when we find the name Picti used by the orator Eumenius. They called themselves Cruithnigh (q.v.) and occupied at that period the north and the centre of the Highlands. The Romans waged continuous war with the Picts and built large walls to keep them out of the conquered provinces. The Saxons at first did not come into contact with this race, but as they pushed farther northward they also encountered the Picts and in 685 were defeated by their King, Brude. After this a continuous border warfare was carried on with varying results. Gradually the Picts were converted to Christianity, and their King, Angus MacFergus (731-761), ruled over the whole of Scotland. Soon thereafter this race disappeared as a separate entity, and in the middle of the ninth century Kenneth MacAlpine, as King of the Scots, ruled over all the different races. It must be stated that concerning nearly everything that pertains to the Picts long disputes have been carried on by scholars. Consult: W. F. Skene, *Chronicles of the Picts and Scots*

(Edinburgh, 1867); id., *Celtic Scotland* (3 vols., ib., 1878-80); Rhys and Brynmor-Jones, *The Welsh People* (New York, 1900).

PICTS' HOUSES. The small stone houses built underground in Scotland probably as places of concealment during wars or other dangers, and the chambered tumuli found in the north of the British Isles, of which Mousa and Maeshow, in the Orkneys, are types. In tradition they have been attributed to the Picts.

PICTURED ROCKS. A series of sandstone cliffs, 300 feet in height, stretching for 5 miles along the shore of Lake Superior, about 45 miles east of Marquette.

PICTURES, MOVING. See MOVING PICTURES.

PICTURES, RESTORATION OF. See RESTORATION OF PAINTINGS.

PICTURE WRITING. See HIEROGLYPHICS.

PICUDA, pi-koo'da. The largest and most voracious of the barracudas (q.v.), of which several species inhabit the American tropical seas. The great barracuda, *picuda*, or *becuna* (*Sphyræna picuda*) reaches a length of 6 feet and is highly valued as food. It is silvery in color, with dark blotches along the sides, and has some inky spots. Other species are known as *picudilla*, *guaguanche*, *spet*, etc., and the larger ones are sometimes dangerous to bathers, attacking them as fiercely as a shark.

PICULET (dim. of *picule*, from Lat. *picus*, woodpecker). Any one of a group of about 30 species of tropical birds, which form a sub-family (Picumninæ) of woodpeckers. They are small, plainly colored, usually marked with black, and with red or yellow on the head, and differ from typical woodpeckers in having short rounded tails without spinous shaft tips, and the nostrils hidden by bristles. Most of them are Central and South American birds. See Plate of WOODPECKERS.

PICURIS, pé-koo'ris. See TANOAN STOCK.

PICUS. A legendary king of Lavinium, father of Faunus and grandfather of Latinus. He was a prophet, a warrior, and a statesman. Because he rejected her love, the sorceress Circe (q.v.) changed him to a woodpecker (Lat. *picus*). Consult Vergil, *Æneid*, vii, 170-191, and Ovid, *Metamorphoses*, xiv, 320-402. The whole story is late and may have arisen from a folk-tale about the woodpecker, a bird sacred to the great god Mars. *Picus* was a deity also of agriculture, especially connected with the artificial fertilizing of the soil.

PIDAL, pé-däl'. See MENÉNDEZ PIDAL.

PIDAL, PEDRO JOSÉ, first MARQUIS DE (1800-65). A Spanish statesman and scholar, member of a noble Asturian family. He served as soldier, deputy in the Cortes, Senator, President of the Cortes, Minister in charge of various portfolios, and Prime Minister. Pidal was a member of the Royal Spanish Academy of the Language, director of the Royal Academy of History, and president of the Royal Academy of Moral and Political Sciences. He received his title of Marquis from Isabella II in 1848.

PIDAL, RAMÓN MENÉNDEZ. See MENÉNDEZ PIDAL, RAMÓN.

PIDAL Y MON, é môn, ALEJANDRO (1847-1913). A Spanish statesman, scholar, and orator, younger son of the first Marquis de Pidal. He served as deputy, member of the Constituent Cortes of 1876, President of the Cortes, and Minister of Public Works. He was a member of the Royal Spanish Academy of the Language (serving as its director from 1907 until his

death), of the Royal Academy of Moral and Political Sciences, of the Royal Academy of History, and of the Madrid Academy of Jurisprudence and Legislation (of which he was president in 1895-98).

PIDAL Y MON, Luís, second MARQUIS DE PIDAL (1842-1913). A Spanish statesman, scholar, and diplomat, son of the first Marquis de Pidal. He served as a deputy in the Cortes (of which he became Secretary), as Ambassador to the Pope, life senator, President of the Senate, President of the Council of State, and Minister of Public Works. He was a member of the Royal Spanish Academy of the Language, of the Royal Academy of Moral and Political Sciences, and of the Academy of Fine Arts of San Fernando. His reforms in education were criticized as unscientific. As an orator and statesman he was a staunch defender of the religious orders.

PIDDIG, pē-dēg'. A town of north Luzon, Philippines, in the Province of Ilocos Norte (Map: Philippine Islands, C 1). It is situated on the Guisi River, 8 miles east of Laoag, with which it is connected by wagon road. Pop., 1903, 9172.

PIDDOCK (of uncertain etymology). A bivalve mollusk of the genus *Pholas*, related to the shipworms (q.v.). The shell is thin, white, very hard, and is beset with calcareous inequalities, connected by fine transverse parallel ridges, forming a kind of rasp, used by the animal for boring a hole in rock, wood, or other substances in which it lives. The animal itself is club-shaped, with large long siphons, united almost to the end, and a short foot. The shell is 2 or 3 inches in length, gaping at both ends and provided with two accessory valves. The siphons are two or three times as long as the shell and are extended to the opening of the hole in which the animal lives. Several species occur on the eastern coast of America, living buried in mud or clay. The commonest species is *Pholas truncata*, which lives in clay or peat banks between tides and burrows into them to a depth of a foot or more. A larger and finer species is *Pholas costata*, found only in deep water. Two or three species are used in Great Britain for bait and for food. In boring its hole the piddock fixes itself firmly by its foot and works itself from side to side, making use thus of the rasping power of its shell. See Colored Plate of CLAMS AND EDIBLE MUSSELS.

PIDGIN, pj'ɪn (Chin. corruption of Eng. *business*), or **PIGEON, ENGLISH**. A mixed language much in use in the ports of China, as a medium of oral communication between foreigners who cannot speak Chinese (merchants, sea captains, sailors, etc.) and such Chinese servants, shopkeepers, compradores, boatmen, etc., as they may have to converse with. It is also occasionally used by natives from different ports whose own dialects are so different as to be mutually unintelligible. It consists of a mixture of English words, mostly monosyllabic, with corrupted Chinese, Portuguese, Malay, and other terms and expressions, arranged according to Chinese idiom. These words are "uninflected" except to the extent that vowel endings such as *o* or *ee* are frequently added after certain consonants which the Chinese in common with the Japanese are unable to pronounce without a following vowel; e.g., *washēe* for "wash," *largee* for "large," *s'possee* for "suppose," *wifo* for "wife." Owing to the inability of the Chi-

nese to pronounce initial *r*, *l* takes its place, and "rice" becomes *lice*; "American" becomes *Melican*, "friend" becomes *fien*, and "try" becomes *tli*. Among the corrupted Chinese words are *bobbery*, noise, disturbance, abuse, scold (either noun or verb), as "you makee too muchee bobbery"; "how fashion you bobbery my?" *Chop* is a mark, brand, or device; *chop-chop* means "quick! make haste!" and the same *chop* occurs in *chopsticks* or "hasteners" used in eating. *Chow-chow* means "food" or "eat"; and *maskee* (probably of Malay or Portuguese origin), "never mind! no matter!" *Belong* takes the place of "be"; *my* is equivalent to "I," "me," "my," "mine" ("no belong my" = I didn't do it, or it is not mine). *Savey* means "know"; "not" is replaced by *no*, and the opening sentence of Hamlet's soliloquy, "To be or not to be! That is the question" is simply rendered by "Can do, no can do! How fashion?" *Joss-pidgin* means religious ceremony, and *Joss-pidgin man*, a priest, clergyman, or missionary. In the same way a tourist or sightseer becomes a *look-see man*, and "get" is expressed by *catchee*. Consult K. Lentzner, *Wörterbuch der englischen Volkssprache Australiens und der englischen Mischsprachen* (Halle, 1891).

PIDGIN, CHARLES FELTON (1844-). An American writer, statistician, and inventor, born at Roxbury, Mass. He received an academic education, was in the mercantile business in Boston in 1863-73, was chief clerk of the Massachusetts Bureau of Statistics and Labor in 1873-1903, and thereafter was chief of the bureau until 1907. Among his inventions for the mechanical tabulation of statistics are an electrical adding and multiplying machine, an addition register, a self-counting tally sheet, and the automatic multiple tabulating machine. He wrote the librettos for a number of musical comedies and cantatas and the words for more than 60 songs and published, among other works: *Practical Statistics* (1888); and the novels *Quincy Adams Sawyer* (1900; rev. ed., 1902), *Blennerrhasset* (1901), *Corsican Lovers* (1905), *Theodosia* (1907), *The Further Adventures of Quincy Adams Sawyer* (1909), *Chronicles of Quincy Adams Sawyer* (1912), with J. M. Taylor.

PIEDMONT, pēd'mōnt (It. *Piemonte*, country at the foot of the mountains). A compartimento of the Italian kingdom embracing the provinces of Turin, Cuneo, Alessandria, and Novara and bounded by Switzerland, France, Liguria, and Lombardy (Map: Italy, A 2). It has an area of 11,331 square miles. Pop., 1911, 3,424,450. In 1247 a partition of the territories of Savoy (q.v.) led to the establishment of the two related lines of Savoy and Piedmont. The rulers of the second line were made princes of the Empire in the early part of the fourteenth century. In 1418 the dynasty became extinct and the land reverted to Savoy. From 1797 to 1814 it was a part of France. It constituted the principal part of the former Kingdom of Sardinia (q.v.), which was not infrequently spoken of as the Kingdom of Piedmont. See ITALY.

PIEDMONT PLAIN. A name used in the physiography of the United States to designate that part of the Atlantic coast plain which lies between the Appalachian highland and the low coastal plain proper. It is distinguished from the latter topographically by being more rugged and eroded with deeper river valleys and

geologically by consisting of much older and harder rock strata. The change from the hard to the soft and recent formation is marked by a definite line of escarpments over which nearly all the Atlantic rivers fall in rapids or cataracts, and the line is known as the "fall line." The piedmont plain is less defined in New England than in the Southern States. It is narrowest and also approaches closest to the sea in New York and broadens southward, being about 300 miles wide in North Carolina.

PIED PIPER OF HAMELIN, THE. A poem by Robert Browning (1842), written for a child of Macready, the actor, on the old legend of the piper who agreed to rid the town of Hamelin of rats in 1284 and, because he was not paid, lured the village children by his playing to a cave in the mountain, where they disappeared.

PIEGAN, pē'gan. See BLACKFOOT.

PIEHL, pēl, KARL FREDRIK (1853-1904). A Swedish Egyptologist, born in Stockholm. He was docent in Egyptian languages at Upsala in 1881, became director of the Egyptian Museum in 1889, and in 1893 was appointed to a newly endowed chair of Egyptology. He traveled much in Europe and Egypt. In 1897 Piehl became editor of the *Sphinx*, a French periodical of Egyptian archaeology. His publications include: *Petites études égyptologiques* (1881); *Dictionnaire du papyrus Harris No. 1* (1882), the great work, *Inscriptions hiéroglyphiques* (3 vols, 1886-95); the popular works *Nilens Strander* (1895) and *Bilder från Egypten* (1896).

PIENZA, pē-ēn'tsā A town in the Province of Siena, Italy, 25 miles southeast of Siena (Map: Italy, C 3). It is interesting because of the extant examples of early Renaissance architecture. The chief of these are the cathedral, with an ecclesiastical museum attached, the Palazzo Pubblico, and the Palazzo Piccolomini. Pop (commune), 1901, 3864, 1911, 3945.

PIEPOWDER, pī'pou'dēr, COURTS OF (also *piepoudre, piedpoudre*, from OF *piepoudroux*, peddler, dusty foot, from *pied*, foot + *poudre*, powder, dust). In mediæval England, inferior courts of limited jurisdiction, instituted for the speedy trial of commercial disputes, arising at fairs and public markets. The name was probably applied to the court from the circumstance that the litigants generally were peddlers and tradesmen who traveled from one fair to another—persons with "dusty feet." Its jurisdiction was extended in some counties to include whole towns or boroughs. This court has fallen into disuse, though it seems never to have been expressly abolished.

PIER. See BRIDGE, CLUSTERED PIER; DOCK; FOUNDATION; HARBOR, WHARF.

PIER, ARTHUR STANWOOD (1874—). An American author, born in Pittsburgh and a graduate of Harvard (1895). After 1896 he was assistant editor of *The Youth's Companion*. An excellent writer of boys' stories, he was honored with membership in the National Institute of Arts and Letters. Among his books may be mentioned: *The Pedagogues* (1899); *The Sentimentalists* (1901); *The Triumph* (1903); *Boys of St. Timothy's* (1904); *An Ancient Grudge* (1905); *Harding of St. Timothy's* (1906); *The Young in Heart* (1907); *The New Boy* (1908); *The Crashaw Brothers* (1910); *The Jester of St. Timothy's* (1911); *The Story of Harvard* (1913); and, in a very different vein, *Women we Marry* (1914).

PIERANTONI, pyā'rān-tō'nē, AUGUSTO

(1840-1911). An Italian jurist, born at Chieti, Italy. He studied at Naples, became a volunteer in Garibaldi's army in 1860, was connected with the Ministry of Education at Naples and later at Turin, and served in the war against Austria after 1866. He held the chair of international law at Modena (1865-66), at Naples (1870-76), and thereafter at Rome. In 1883 he was chosen Senator of the Kingdom. Pierantoni published many works on international law, of which *Il progresso del diritto pubblico e delle genti* (1866) and *Storia degli studi del diritto internazionale in Italia* (1869; 2d ed., 1902) were translated into German.

PIERCE, pērs, FRANKLIN (1804-69). The fourteenth President of the United States. He was the son of Gen. Benjamin Pierce, a soldier of the Revolution and twice Governor of New Hampshire, and was born at Hillsborough, N. H., Nov. 23, 1804. He graduated in 1824 at Bowdoin College, where he formed a lifelong friendship with Nathaniel Hawthorne and had among his other college mates John P. Hale, S. S. Prentiss, and Henry W. Longfellow. After leaving college he studied law in the law office of United States Senator Levi Woodbury, also in offices at Northampton, Mass., and at Amherst, N. H., and was admitted to the bar in 1827. Two years later he took a seat in the State House of Representatives as a Democrat. He was thrice reelected and for two terms served as Speaker. In 1832 he was elected a Representative in Congress and was reelected in 1834. In 1837 he was elected to the United States Senate, and when he took his seat he was the youngest member of that body. As a member of Congress he supported by his speeches and votes the policy of President Jackson. He opposed appropriations for the Military Academy at West Point, the renewal of the United States Bank charter, and the policy of internal improvements and was averse to the spoils system. In 1842, before the expiration of his term as Senator, he resigned and resumed his law practice, settling in Concord, N. H. He successively declined an appointment to fill a vacancy in the Senate, refused the nomination for Governor of New Hampshire, would not accept the office of Attorney-General of the United States tendered by President Polk, and announced it as his fixed purpose never again to accept public office. He did not, however, cease to take interest in public affairs and during his retirement took an active part in the councils of his party, openly advocated the annexation of Texas, and took the stump against his former college mate, John P. Hale (q.v.), the successful Antislavery candidate for the United States Senate. Upon the outbreak of the Mexican War Pierce promptly volunteered as a private soldier. He was soon appointed colonel, and in March, 1847, received a commission from the President as brigadier general of volunteers. He at once sailed for Vera Cruz and joined General Scott in time to participate in the battles of Contreras and Churubusco. In the former engagement he was thrown from his horse, but, although painfully injured, he refused to leave the field. Upon the conclusion of peace he resumed his law practice, which was again interrupted in 1850 by his election as a delegate to the New Hampshire Constitutional Convention, over the deliberations of which he was chosen to preside by an almost unanimous vote. At the Democratic National Convention, held at Baltimore in June,

1852, he was brought forward, after 35 ballotings, as a compromise candidate for the presidency and was nominated on the forty-ninth ballot, defeating Buchanan, Douglas, Cass, and Marcy. On account of his personal popularity and his conservative position with regard to the slavery question, General Pierce was able to draw to his support a large number of voters in the North, among them many Whigs, and consequently defeated General Scott, the Whig candidate, by a vote of 254 to 42. He carried every State except Massachusetts, Vermont, Kentucky, and Tennessee and received a larger electoral vote than had ever before been cast for a presidential candidate. He chose a strong cabinet: William L. Marcy, Secretary of State; Jefferson Davis, Secretary of War; James Guthrie, Secretary of the Treasury; James C. Dobbin, Secretary of the Navy; Robert McClelland, Secretary of the Interior; James Campbell, Postmaster-General; Caleb Cushing, Attorney-General. This is the only cabinet in the history of the country that did not suffer a break during the presidential term. The chief events of Pierce's administration were the Gadsden Purchase (q.v.), the Koszta affair (q.v.), the conclusion of commercial treaties with Great Britain and Japan, the bombardment of Greytown, Nicaragua, the reorganization of the diplomatic and consular service, and the creation of a United States court of claims. In the matter of foreign relations the administration was quite successful. As regards the slavery question the policy of President Pierce, who was concerned chiefly about the preservation of the Union and cared little about the abolition of slavery, caused much discontent in the North. The chief events under this head were the promulgation of the Ostend Manifesto (q.v.) and the enactment of the Kansas-Nebraska Bill (q.v.), which brought on strife between the proslavery and free-State settlers in Kansas. From 1855 to the end of Pierce's term the chief problem was that of governing Kansas and maintaining peace therein—a matter in which the President supported the proslavery party. Upon the expiration of his term Pierce traveled for several years in Europe, taking no further part in politics. He died Oct. 8, 1869. A monument was erected to him at Concord, N. H., in 1914. Consult two "campaign" biographies, published in 1852, written by Nathaniel Hawthorne (Boston) and D. W. Bartlett (Auburn); also J. E. Cooley, *Review of the Administration of General Pierce* (New York, 1854); A. E. Carroll, *Review of Pierce's Administration* (Boston, 1856); J. R. Irelan, *History of the Life, Administration, and Times of Franklin Pierce* (Chicago, 1888); J. F. Rhodes, *A History of the United States from the Compromise of 1850*, vol. i (New York, 1901); "Some Papers of Franklin Pierce," published in the *American Historical Review*, vol. x (ib., 1904-05); T. C. Smith, *Parties and Slavery* (ib., 1906). See UNITED STATES.

PIERCE, GEORGE FOSTER (1811-84). A bishop of the Methodist Episcopal Church South. He was born in Green Co., Ga., the son of Lovick Pierce. He studied law, but entered the Georgia conference of his denomination in 1831. Pierce was president of Georgia Female College, Macon (1839-42), and president of Emory College, Oxford, Ga. (1849-54). In 1854 he was elected Bishop. His sermons and addresses were edited and published by Bishop A. G. Haygood (1886).

PIERCE, LOVICK (1786-1879). A minister of the Methodist Episcopal Church South, father of George Foster Pierce. Born in Halifax, Co., N. C., he entered the South Carolina conference of his denomination in 1805, though he had begun to preach the year before, and was chaplain in the army during the War of 1812. At the close of the war he retired from the ministry and studied and practiced medicine, but, returning to his first profession in 1823, he had various important charges and represented his conference in numerous general conferences.

PIERIDÆ, pî-êr'î-dê. A family of butterflies noted for mimicry. See MIMICRY.

PIERIDES, pî-êr'î-dêz (Lat., from Gk. Περίδες). 1. A name given to the Muses from their birthplace, Pieria in Thessaly. 2. According to late mythology, the nine daughters of Pierus, King of Emathia, a district in Macedonia, whom he named after the nine Muses. When they were defeated by the Muses in a musical contest, they were changed into magpies.

PIERNÉ, pyâr'nâ', GABRIEL (1863-). A French composer and orchestral conductor, born at Metz. He graduated at the Paris Conservatory, where he won many important prizes, including the Prix de Rome in 1882. He became organist at Sainte-Clothilde in 1890, succeeding César Franck, and subsequently devoted himself chiefly to composition. He wrote the grand operas *Salomé* (1895) and *Vendée* (1897); the comic opera *Le docteur Blanc* (1893), *La coupe enchantée* and *La princesse Loiraine* (1895); several operettas and incidental music to plays; the oratorios *Les enfants de Bethléhem* (1907) and *St. François d'Assisi* (1913); the choral works *Pandora* and *Croisade des enfants*, a choral symphony *L'An mil*; and orchestral suite *La nuit de Noël de 1870*; a piano concerto in C minor, chamber music and songs.

PIERO, NICCOLO DI. See NICCOLO OF AREZZO.
PIERO DELLA FRANCESCA. See FRANCESCA, PIERO DELLA.

PIERO DI COSIMO, pyâr'ô dê kô-zê-mô (1462-1521). A Florentine painter of the Renaissance. He was a pupil of Cosimo Rosselli, from whom he derived his name and whom he assisted in painting the frescoes in the Sistine Chapel, where "The Destruction of Pharaoh's Host" is ascribed to him. Afterward the influence of Leonardo da Vinci becomes apparent in his works, which are characterized by bizarre and romantic imagination, dry color, and occasional breadth of design. Among the most remarkable are: "Perseus Delivering Andromeda," Uffizi, Florence; "Holy Family," Dresden; "Venus with Cupid and Mars," Berlin; "Coronation of the Virgin," Louvre; "Death of Procris," National Gallery, London. He is represented in the Jarves collection, Yale University, the Metropolitan Museum, New York, and the Johnson collection, Philadelphia. A special feature of his pictures is the fine landscape backgrounds. His principal pupils were Fra Bartolommeo and Andrea del Sarto. For his biography, consult Fritz Knapp, *Piero di Cosimo* (Halle, 1899).

PIEROLA, pè'a-rô'lâ, NICHOLAS DE (1839-1913). A Peruvian politician, born at Camaná. He was educated for the law and served as Minister of Finance during Balta's administration (1869-72). He was implicated in the revolts against Prado in 1874 and 1877, and when in the war with Chile Prado deserted his post, Pierola assumed the leadership of the revolution and was proclaimed supreme chief at Lima,

in the closing days of 1879. In 1881 he was defeated and was obliged to retire into the interior. Four years later he made an unsuccessful attempt to seize the presidency and was banished in consequence. In 1894 he headed another revolt, overthrew President Cáceres, was himself elected President in 1895, and held the office until the expiration of his term, Sept. 10, 1899.

PIERPONT, FRANCIS HARRISON (1814-99). An American political leader, born in Monongalia Co., Va. (now West Virginia). He supported himself while studying and graduated at Allegheny College (Pennsylvania) in 1839. He began the practice of law at Fairmount, Va., about 1845. He was a pronounced Abolitionist and was an elector on the Whig ticket in 1848. After Virginia seceded, representatives from 40 western counties met in convention at Wheeling, June 11, 1861, organized the "Restored Government of Virginia," and elected him Governor. He was recognized by President Lincoln and raised troops for the Federal army. In the fall he was elected by the loyal people for the unexpired term of two years and then for a full term of four years. When West Virginia was admitted to the Union as a separate State in June, 1863, he removed his capital to Alexandria under the protection of the Federal army. When Richmond was evacuated, he removed there and acted as Governor of the entire State until 1868. He then returned to Fairmont and sat in the West Virginia Legislature in 1870. President Garfield appointed him collector of internal revenue, in which capacity he served until the consolidation of his district.

PIERPONT, JAMES (?-). An American mathematician. He graduated B.S. from Worcester Polytechnic Institute in 1886 and Ph.D. from the University of Vienna in 1894, and received the honorary degree of A.M. from Yale University in 1899 and that of LL.D. from Clark University in 1909. At Yale he was lecturer in mathematics in 1894-95, instructor in 1895-96, assistant professor in 1896-98, and thenceforth professor. Pierpont is author of *Lectures on the Theory of Functions of Real Variables* (1905); *The History of Mathematics in the Nineteenth Century* (1905); *Functions of a Complex Variable* (1914).

PIERPONT, JOHN (1785-1866). An American clergyman and poet. He was born in Litchfield, Conn., graduated from Yale College in 1804, and practiced law at Newburyport, Mass. After unsuccessful business ventures in Boston and Baltimore he studied theology at Harvard Divinity School and in 1819 was ordained pastor of the Hollis Street Unitarian Church in Boston. His advocacy of antislavery, temperance, and other reforms caused his withdrawal from that parish in 1845, after which he became pastor of Unitarian churches at Troy, N. Y., and Medford, Mass. In the Civil War he was appointed, though 76 years old, chaplain of a Massachusetts regiment, but was soon transferred to the United States Treasury Department. He published, among other volumes: *Airs of Palestine* (1816; republished and enlarged as *Airs of Palestine and Other Poems* in 1840) and *Anti-Slavery Poems* (1843). He was the grandfather of John Pierpont Morgan (1837-1913). Consult J. G. Wilson, *Bryant and his Friends* (New York, 1886), and A. A. Ford, *J. Pierpont* (Jamaica Plain, Mass., 1909).

PIERRE, pĕr. A city, the county seat of Hughes County and the capital of South Dakota,

situated near the centre of the State, about 120 miles (direct) southwest of Aberdeen, on the Missouri River and on the Chicago and Northwestern Railroad (Map: South Dakota, D 3). It has the State library, a government industrial school for Indians, a Federal courthouse, United States land office, State capitol, Carnegie library, a fine Federal building, St. Mary's hospital, and good schools. A million-dollar railroad bridge crosses the river at this place. Pierre is the centre of an extensive stock-raising and farming district, and it is the largest stock market in the State. Underlying the city are supplies of natural gas, which is used for lighting and heating and for industrial purposes. Pierre was settled in 1880 and incorporated three years later. It is governed by a mayor and four commissioners. The water works, gas plant, and electric-light plant are owned by the municipality. Pop., 1900, 2306; 1910, 3656.

PIERRE D'AUBUSSON. See AUBUSSON, PIERRE D'.

PIERRE DE MONTEREAU. See MONTEUIL, PIERRE DE.

PIERREPONT, pĕr'pōnt, EDWARDS (1817-92). An American lawyer and diplomat, born at North Haven, Conn. He graduated at Yale in 1837, was admitted to the bar in 1840, and practiced at Columbus, Ohio, until 1845, when he removed to New York. He was elected judge of the Superior Court, New York, in 1857, but resigned in 1860 and resumed his practice. In 1867 he conducted the case for the government against John H. Surratt, indicted as an accomplice in the murder of Lincoln. Appointed United States district attorney by President Grant in 1869, he resigned a year later and then took an active part as one of the Committee of Seventy in fighting the Tweed ring. He was appointed Attorney-General of the United States in 1875 and in 1876-77 was Minister to the Court of St. James. He published several pamphlets on financial questions.

PIERROT, pyä'rō'. A character of French comedy from the Italian Pedrolino of the *commedia dell'arte*. Towards the beginning of the eighteenth century he appeared on the French stage in parodies at the Opéra Comique and other theatres. The Pierrot of the pantomime was introduced by Debureau at the Funambules and reappeared with the revival of the pantomime at the end of the nineteenth century. See HABLEQUIN.

PIERSON, pĕr'son, ABRAHAM (c.1645-1707). An American educator. He was born at Lynn, Mass., graduated at Harvard in 1668, became assistant pastor to his father at Newark in 1672, and was in sole charge of the New Church from 1678 to 1692. He then preached for two years in Greenwich, Conn., became pastor at Killingworth, Conn., in 1694, and from 1701 until his death was the first president, or rector, of Yale College. See YALE UNIVERSITY.

PIERSON, ARTHUR TAPPAN (1837-1911). An American Presbyterian minister, born in New York City. Graduating at Hamilton College in 1857 and at Union Theological Seminary in 1860, he was pastor of Congregational churches at Binghamton, N. Y., in 1860-63, and at Norwalk, Conn., in 1863. Subsequently he had charge of Presbyterian churches at Watford, N. Y. (1863-69), Detroit (1869-82), Indianapolis (1882-83), and Philadelphia (1883-91). Dr. Pierson occupied the pulpit of the

Metropolitan Tabernacle, London, from 1891 to 1893 and that of Christ Church in the same city for two periods (1902-03, 1907-08). From 1888 he was editor of the *Missionary Review of the World*. His writings include: *Many Infallible Proofs* (1886); *Keys to the Word* (1888); *The Inspired Word* (1890); *Divine Enterprise of Missions* (1891); *New Acts of the Apostles* (1894); *Stumbling Stones Removed* (1896); *Forward Movements of the Last Half Century* (1900); *Seed Thoughts for Public Speakers* (1901); *The Modern Mission Century* (1901); *The Making of a Sermon* (1904; 2d ed., rev., 1907); *God's Living Oracles* (1904); *Bible and Spiritual Criticism* (1906); *The Bible and Spiritual Life* (1908). Consult J. K. Maclean, *Dr. Pierson and his Message* (New York, 1911), and D. L. Pierson (q.v.), *A Spiritual Warrior*—Arthur Tappan Pierson (ib., 1912).

PIERSON, DELAVAN LEONARD (1867-). An American religious journalist. Born at Waterford, N. Y., he graduated from Princeton in 1890 and from Princeton Theological Seminary four years later. As early as 1884 he had become identified with editorial work. From 1891 to 1911 he was managing editor of the *Missionary Review of the World* and thenceforth was editor in chief. In 1894-1904 he also served as editor of *Northfield Echoes*, and he was editorial writer for the *Record of Christian Work* after 1905 and for the *Sunday School Times* after 1907. Pierson is author of *For Each New Day* (1896); *The Pacific Islanders* (1906); and a biography of his father, Arthur Tappan Pierson (q.v.).

PIERS (pěrs or pěrz) **PLOWMAN**. See **LANGLAND, WILLIAM**.

PIERS PLOWMAN'S CREDE. An alliterative poem, written about 1394 by an unknown poet whom Skeat identifies with the author of the *Plowman's Tale*. An ignorant man, wanting to learn his creed, applies to friars for help. They merely show their greed and jealousy of one another, and the creed is taught at last by a poor plowman. See **LANGLAND, WILLIAM**.

PIESTRE, pyēs'tr', **FERNAND**. See **COBMON, FERNAND**.

PIETÀ, pyà-tà'. Bemoaning of the dead Christ by his Mother, a favorite subject of Christian art. The incident occurred just after the deposition and before the entombment and is represented as occurring at the foot of the cross. The Maries and the other holy personages who participated in the entombment are usually added. In the Latin church the Virgin is represented sustaining the head of Christ in her lap, while the Magdalene laments at his feet. The incident was often depicted in Byzantine art, and nearly all great Italian painters, beginning with Giotto in the Arena Chapel, represented it. Among the principal were: Ambrogio Lorenzetti (Siena Academy); Fra Angelico (San Marco, Florence); Perugino (Pitti Palace, Florence Academy); Botticelli (Munich); Francia (London); often by Crivelli (Metropolitan Museum, New York); Mantegna and Giovanni Bellini (Brera, Milan); Fra Bartolomeo (Pitti Palace), wonderfully profound in religious feeling; Correggio (Parma Gallery); and Titian (Venice Academy). The Pietà was also represented in the same spirit of profound religious feeling by early Netherlandish and German painters, like Rogier van der Weyden (Berlin), Quinten Matsys (Antwerp), and Schongauer and Dürer in engrav-

ings. The representation of the subject did not improve in the late sixteenth and seventeenth centuries, when technical efficiency replaced religious feeling, as in Rubens (Brussels) and Van Dyck (Munich). It was often carved by Gothic sculptors of the late Middle Ages; a good French example is in the Metropolitan Museum, New York. Among Italian sculptors it was powerfully represented by Donatello (Padua, London) and by Michelangelo (St. Peter's, Rome). Consult the bibliography of **JESUS CHRIST IN ART**.

PIETAS (Lat., devotion to duty, in all its phases). In Roman mythology, the goddess of loyalty, especially of filial devotion. She is symbolized by the stork. As an abstract quality, signifying devotion to duty in all the varied relations of life, *pietas* figures largely in Latin writers, especially in the *Aeneid* of Vergil, who repeatedly calls Aeneas *pius*. Consult W. W. Fowler, *The Religious Experience of the Roman People* (London, 1911).

PIETER DE KEMPENEER, pē'tēr de kēm'-pe-nār. See **KEMPENEER, PETR DE**.

PIETERMARITZBURG, pē'tēr-mār'its-bûrg. The capital of the British colony of Natal, South Africa, 40 miles by rail northwest of Durban, the chief port of the colony (Map: South Africa, K 7). It is well built, 2200 feet above sea level, and noted for its healthful climate. It has considerable trade and is the seat of an Anglican bishop. Its chief features are the government buildings, town hall, a fine park, botanical gardens, and bathing establishments; it has electric lighting. The town was founded by the Boers in 1839 and named after the two Boer leaders Pieter Retief and Geert Maritz. Pop., 1904, 31,199; 1911, 30,555 (14,737 whites, 7789 Asiatics, and the rest natives).

PIETISM (from *piety*, OF. *piete*, Fr. *piété*, from Lat. *pietas*, piety, from *pius*, pious). A name given in the latter part of the seventeenth century to a religious movement in Germany, distinguished by certain peculiarities of religious opinion and the manner in which these were manifested. The name is sometimes applied, though with less correctness, to similar tendencies of opinion, feeling, and conduct exhibited elsewhere. Pietism may be regarded as an exaltation of the importance of religious feeling and of the practical part of religion, with a corresponding depreciation of doctrinal differences and of outward ecclesiastical arrangements.

German pietism was the natural outcome of conditions existing in the seventeenth century. The Reformers had emphasized the efficacy of faith in Christ as the means of securing deliverance from sin. But the controversies which arose among them and increased among their successors gradually gave a too exclusively doctrinal and polemical character to the sermons and writings of both Lutheran and Calvinistic divines. When the inevitable reaction came it took form in favor of a religion of feeling and good works or of the heart and life. Johann Arndt (1555-1621), Johann Valentin Andreæ (1586-1654), both Lutherans, and Johannes Coccejus (1603-69), a Calvinist, may be regarded as forerunners of pietism. But its full development is to be ascribed to Philipp Jakob Spener (q.v.) and his friends and disciples, particularly the Leipzig doctores, Paul Anton, J. K. Schade, and August Hermann Francke. It began with private devotional meetings in

the house of Spener (*collegia pietatis*), whence the movement had its name. Driven from Leipzig by the opposition of the older school of theologians, Francke and Anton found a refuge, through Spener's influence, in the newly founded University of Halle, and under their lead and that of their associates, Joachim Justus Breithaupt and Hermann Lange, Halle became the centre of the movement and a source of new religious life in Germany. Pietism also became dominant in the universities of Königsberg, Giessen, and Marburg and from north Germany spread to the south, where its head was Johann Albrecht Bengel, and even to other lands. Ultimately it went to excess, fantastic doctrines and fanatical practices came to prevail, and the rationalism of the eighteenth century was the inevitable and healthful reaction. See GERMAN THEOLOGY, III; also articles under BENDEL, FRANCKE, SPENER, and other leaders.

Bibliography. August Tholuck, "Geschichte des Pietismus und das ersten Stadiums der Aufklärung," in *Geschichte des Rationalismus*, vol. i (Berlin, 1865); Heinrich Heppel, *Geschichte des Pietismus und der Mystik in der reformierten Kirche, namentlich der Niederlande* (Leyden, 1879); Albrecht Ritschl, *Geschichte des Pietismus* (3 vols., Bonn, 1880-86); J. F. Sachse, *German Pietists of Provincial Pennsylvania* (Philadelphia, 1895); W. Hübener, *Pietismus geschichtlich und dogmatisch geschildert* (Zwickau, 1901); J. Jungst-Stettin, *Pietisten* (Tübingen, 1906); H. von Schubert, *Outlines of Church History* (Eng. trans. by M. A. Canney from 3d Ger. ed., London, 1907); Horst Stephan, *Der Pietismus als Träger der Fortschritts* (Tübingen, 1908).

PIET PAALTJENS, pēt pālt'yēns. See HAVERSCHMIDT, FRANÇOIS.

PIETRABONDANTE, pyā'trā-bōn-dān'tā. See BOVIANUM, 1.

PIETRA DURA, pyā'trā dōō'rā (It., hard stone). A name given to the finest kinds of Florentine mosaic work, in which the inlaid pieces, each cut to the shape of its bit of color in the pattern, are of hard stone, such as jasper, carnelian, amethyst, agate, etc. The real pietra-dura work dates as far back as to 1570 and from that time to the present has been almost confined to Florence, where a government atelier has existed ever since the beginning of the seventeenth century. In that century an inferior kind came into use, especially in Naples, where colored cements, made by crushing refuse bits of the hard stones, were substituted for the cut stone. When highly polished this sort can hardly be distinguished from the better kind. The art was carried by Italians to the Mogul courts of India, where it formed an important part of the decorative splendor of the palaces of Delhi and Agra and of the Taj Mahal (q.v.). The inferior kinds are at present manufactured in Derbyshire and other parts of Britain as well as in Italy.

PIETRAPERZIA, pyā'trā-pēr'tsā-ā. A town in the Province of Caltanissetta, Sicily, 7 miles southeast of Caltanissetta (Map: Italy, E 6). It has an old Norman fortress and carries on a trade in grain and almonds. There are sulphur and gypsum mines in the vicinity. Pop. (commune), 1901, 12,826; 1911, 12,190.

PIETRASANTA, pyā'trā-sān'tā. A town in the Province of Lucca, Italy, 15 miles northwest of Lucca by rail and 2 miles from the Mediterranean (Map: Italy, C 3). It is situ-

ated on a hill, on the top of which is a large fortress, and is surrounded by a wall. The fourteenth-century church of San Martino has fine choir stalls and a baptistry with bronze decorations by Donatello. The surrounding country is fertile, and the grape and olive are produced in abundance. There are marble quarries and quicksilver mines. Pop. (commune), 1901, 17,444; 1911, 19,868; (town) 8700.

PIETRO DELLA VALLE. See VALLE, PIETRO DELLA.

PIETRO DELLA VIGNA, pyā'trō dēl'la vē'nyā. See PETER DE VINEA.

PIETRO DE' MEDICI. See MEDICI, PIETRO.

PIETSCHMANN, pēch'mān, RICHARD (1851-). A German Orientalist and librarian. He was born at Stettin, studied in Berlin and Leipzig (Ph.D., 1874), and was librarian of several universities, but especially at Göttingen, where in 1889-90 he was also professor of Egyptology and Oriental history. He wrote: *Hermes Trismegistos* (1875); *Geschichte der Phönizier* (1889); *Geschichte des Inkarciches* (1906); and translations of Maspero's Oriental history (1877), and of the part dealing with Egypt in Perrot and Chipiez, *Histoire de l'art dans l'antiquité* (1884).

PIEZOMETER, piē-zōm-ē-tēr (from Gk. πιέζειν, piezein, to press + μέτρον, metron, measure). An instrument for measuring the compressibility of fluids, originally devised by Orsted (q.v.) in 1822, to determine the compressibility of water, mercury, alcohol, and other liquids. It consisted of a cylinder of thick glass closed at either end by a brass cap. A tube of glass or brass containing a piston or a screw plug was fitted to the upper cap, by means of which considerable pressure could be exerted on the liquid in the cylinder below. This cylinder was sufficiently large to contain a glass flask whose neck was drawn out into a fine tube, like that of a thermometer, graduated into equal divisions, each of which represented a certain fraction of the volume of the flask. When the piston was pushed or screwed down, the liquid in the cylinder was put under pressure. This pressure was communicated to the liquid in the flask, which was compressed by a small amount, as was shown by the rise of the mercury in the fine tube. Knowing the volume of the flask and the value of the divisions of the tube, the amount of compressibility was readily ascertained by the pressure shown by a manometer. Orsted found that the compressibility of water for one atmosphere of pressure amounted to 46.65 millionths. Colladon and Sturm, who performed a series of similar experiments, made this value 49.65 millionths, while Grassi somewhat later fixed the compressibility of water at 0° C. at 50 millionths, and at 53° C. at 44 millionths. With the piezometer it was also demonstrated that liquids are perfectly elastic, since when the pressure is removed the mercury sinks to its former position, showing that the liquid returns to its original volume.

PIFFARD, pif'ard, HENRY GRANGER (1842-1910). An American physician, born at Piffard, N. Y., a town founded by his father. He graduated from the University of the City of New York and in 1864 from the College of Physicians and Surgeons. At the former institution (which became New York University) he held the chair of dermatology from 1875 till his retirement in 1910. Piffard did

not restrict himself to dermatology, but was an original investigator in nearly every branch of medicine, was an accomplished microscopist, physicist, botanist, and investigator in therapeutics, and widely known as a linguist. He was the first in the United States to employ high-frequency currents scientifically and intelligently. During the last years of his life he devoted much study to the etiology of tuberculosis. He was a founder of the Dermatological Society and its president. Besides translating Dartrous's *Diatheosis* (1868), he published a number of works on dermatology and many important articles.

PIFFERARI, piff'a-rà-ré (It., pipers). The name given to shepherds of the Abruzzi who formerly flocked to Rome in the Advent season and collected gifts at the shrines of the Virgin, where they sang and played old airs on pipes and bagpipes.

FIG. See Hog; SWINE.

FIGAFETTA, pè'gá-fet'tà, (FRANCESCO) ANTONIO (1491-c.1534). An Italian traveler and historian, born at Vicenza. He was with Magellan's expedition of circumnavigation, of which he published the chief account (see Milan ed., 1800).

PIGALLE, pé'gál', JEAN BAPTISTE (1714-85). A French sculptor, born in Paris. He was a pupil of Robert le Lorrain and Lemoyne and then studied in Rome. In 1744 he was elected to the academy, where he became professor in 1752 and rector in 1777. His statuette "Mercury Fastening his Sandal," one of the gems of eighteenth-century art (replica in the Altman collection, Metropolitan Museum, New York); a "Child with Cage"; the busts of Marshal Maurice of Saxony (1750) and of the surgeon Guérin; and the group "Love and Friendship" are in the Louvre. Other works by him include: "Mercury," in the Berlin Museum; "Venus," at Potsdam; the monument to Louis XV, at Rheims (figure entirely new); a marble group of the "Queen of Heaven," in Saint-Sulpice, Paris; the tomb of the Comte d'Harcourt (partly destroyed, but restored) in Notre Dame, Paris; a statue of Voltaire in the library of the Institute; and his masterpiece, the tomb of Marshal Maurice of Saxony, in the church of St. Thomas at Strassburg. Pigalle possessed rare skill, grace, and fire, but he sometimes lacked moderation and often spoiled his larger works by complicated allegory. Consult Tarbé, *La vie et les œuvres de J. B. Pigalle* (Rheims, 1859).

PIGAULT-LEBRUN, pé'gô'-le-brün', CHARLES (1753-1835). A French novelist, whose real name was Pigault de l'Épiney. He was born at Calais and lived early in Paris, but left the capital because of escapades. In 1791 he enlisted and fought at Valmy. The next year appeared his first novel, *L'Enfant du Carnaval*; it had a tremendous success. He wrote also: *Les barons de Felsheim* (1798); *Angélique et Jeanneton* (1799); *Mon oncle Thomas* (1799); *Monsieur Botte* (1802), his best work. Pigault-Lebrun was the grandfather of Emile Augier (q.v.), who dedicated to him his drama *La ciguë* (1844). His wit was coarse, but often keen.

FIG DEER. See BABIRUSSA.

PIGEON, pij'un (OF. *pigeon*, *pipion*, Fr. *pigeon*, It. *picoione*, *pippione*, pigeon, from Lat. *pipio*, squab, young bird, from *pipire*, to chirp, onomatopoeic in origin). A name applied, like

dove (q.v.), to all members of the family Columbidae. Although members of the group differ greatly in size and color, with a few exceptions they are easily recognized. They are chiefly medium-sized or rather large birds. Most of those of temperate regions are plainly colored with gray, brown, or slate, and some black and white, but some of the tropical forms show brighter shades of blue and purple; while the fruit pigeons of the far Orient are gorgeous in green, yellow, orange, red, violet, and blue. The wings are usually long and pointed, the tail more or less elongated. The crop is large and double; during the breeding season it becomes glandular and secretes a milky fluid upon which the young are in part fed, or at any rate it moistens the food given them by their parents. The plumage of pigeons is generally very dense, quite smooth, often reflecting metallic lustres; the feathers entirely lack the aftershaft. Pigeons are monogamous, and the birds seem much attached to each other and share the labors of nest building, incubating, and caring for the young. The nests are always flimsy structures of a few twigs in a tree, and the eggs, almost always numbering two, are pure white. The young are naked and helpless when hatched. Pigeons are vegetarians and eat fruit, grain, seeds, and the like and are therefore often destructive in cultivated fields. Their notes are soft, low, and rhythmic—well described as "cooing." The flesh of most species is good eating, and they are ranked game birds and are much hunted. The flesh is nutritious; that of the young, or squabs, from 20 to 25 days old, is particularly delicate, and in some parts of the United States great numbers of domesticated doves are reared for market. On some farms upward of 10,000 squabs are sold annually to supply the demand for this delicacy.

More than 650 forms of pigeon are known, of which nearly or quite half are the so-called fruit pigeons of the East. The geographical distribution of the pigeons, living and extinct, suggests some of the most interesting inquiries in zoölogy. One interesting fact is that pigeons are usually absent from regions where monkeys abound, as these nimble thieves rob their open, unprotected nests so persistently that the two races cannot dwell in the same district. Fourteen species have been taken within the boundaries of the United States, but eight of these are West Indian or Mexican species, found only occasionally along the southern boundary. The remaining four are the little ground dove (q.v.); the common "mourning" or Carolina dove (*Zenaidura macroura*), abundant throughout temperate North America; the band-tailed pigeon (*Columba fasciata*), a large stout species, with a noticeable black bar across the bluish-ash tail, common from the Rocky Mountains to the Pacific; and the formerly very numerous "wild" or "passenger" pigeon.

The North American wild pigeon (*Ectopistes migratorius*) is especially interesting from the marvelous numbers composing its flocks before the settlement of the interior of the country caused its total disappearance. What was supposed to be the last survivor died in the Zoölogical Gardens in Cincinnati in the summer of 1914. The wild pigeon was a large slender bird, with a small head, notched beak, turned at the base, short strong legs with naked feet, a long acuminate tail, and long, pointed, and powerful wings. It was a beautiful bird, of graceful form

PIGEONS



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- 1 HOMING PIGEON
- 2 TURBIT
- 3 POUTER
- 4 BLACK FANTAIL
- 5 JACOBIN
- 6 CARRIER
- 7 BLACK NUN

and finely colored plumage, and formerly was found in almost all parts of North America. It was not, properly speaking, a bird of passage, as apparently its movements depended on the failure of a supply of food in one locality and the necessity of seeking it in another. The nest of the passenger pigeon consisted of a few dry twigs placed in a fork of the branches of a forest tree and contained two eggs. They bred two or three times in a season. During the early part of the nineteenth century incredible numbers of pigeons were wont to roost at night and nestle in certain breeding places in the forests of the Mississippi valley, where sometimes 100 or more nests were often seen in a single tree. These great breeding places extended over a tract of forest, sometimes not less than 40 miles in length. Flocks of pigeons were often seen flying at a great height in dense columns, 8 or 10 miles long; and calculations made by careful observers agreed that in some of their great migrations the column, a mile broad, was more than 150 miles long. The roosting places were correspondingly extensive. The noise of wings and of cooing voices drowned the report of guns. The multitudes that settled on trees broke down great branches with their weight, so that it was dangerous to pass beneath. They crowded together, alighting one upon another, till they formed solid masses like hogsheads, and great numbers were killed by the breaking of branches. The inhabitants of the neighboring country would assemble, shoot them, knock them down with poles, stifle them by means of pots of burning sulphur, cut down trees in order to bring them in great numbers to the ground, eat them fresh, salt them, and bring hogs to fatten on them. Wolves, foxes, lynxes, cougars, bears, raccoons, opossums, polecats, eagles, hawks, and vultures congregated to share the spoils.

Such are the facts given by Wilson, Audubon, and the early historians of the West and abundantly verified. The disappearance of these birds, as soon as settlers began to invade and clear away the woods, was so rapid as properly to be called sudden, and it is not easily explained.

Of the pigeons of the Old World, the most interesting is doubtless the blue rock pigeon, or rock dove (*Columba livia*), the "biset" of the French, a bird of extensive geographical range. It is found as far north as the Faroe Islands and over the greater part of Europe, and breeds in crevices of rocks and often within caverns that open on the sea. In a wild state this bird exhibits great uniformity both in size and plumage; the prevailing color is bluish gray, with two distinct bars of black across the closed wings. It is commonly believed that domestic pigeons are all descended from this species, although possibly some were derived from the very similar *Columba intermedia*. The ordinary domestic pigeon differs from the wild chiefly in color, but it has a constant tendency to revert to the original coloring. There are 250 or more domestic breeds, and they have undergone many remarkable changes under the selective care taken by intelligent fanciers, who often pay very high prices for fine birds. Some of the varieties that exhibit very strange peculiarities are known as "fancy" pigeons and are carefully tended and preserved by pigeon fanciers. Of these may be mentioned, as among the most interesting, the rough-footed pigeon, having the feet feathered; the Jacobin, which has a range

of feathers inverted over the head and extending down each side on the neck, as a hood; the fan-tail, in which the number of the tail feathers is greatly increased and the bird has the power of erecting its tail like that of a turkey cock; the tumbler, so called from turning somersaults in the air in its flight and further characterized by a very short bill; the pouter or "cropper," which has the power of blowing up its crop to an extraordinary degree, so that the head seems fastened on the top of an inflated bladder; and the black nun.

None of these have the popular interest and value, however, of the carrier, homer or homing pigeon, which is trained to return to its home from great distances and is utilized for carrying messages in places where sometimes no other means of communication is available. This represents the highest example of pigeon development. This breed is of large size, about 15 inches long, and has the cere very large and carunculated, the eyes surrounded with a broad circle of naked red skin, and the wings reaching nearly to the extremity of the tail. Carrier pigeons are trained by being conveyed, when young, to short distances of a few miles from home and then let loose, the distance being gradually increased till the pigeon may be made to return accurately and swiftly from 500 to 600 miles away. Pigeons intended for this use must be brought from the place to which they are to return within a short period (not exceeding a fortnight) of their being let loose and at a time when they have young in their nest, their remarkable fecundity affording particular facilities for their employment in this way. The impulse of the bird is to return to its family with the utmost haste.

The use of carrier pigeons is very ancient in the Orient and was brought to the attention of Europe at the time of the First Crusade, when the Saracens were found to have the birds in regular use for the conveyance of information; and the Christian commanders employed falcons to chase and intercept this pigeon post on several occasions and on others caught the tired birds, substituted misleading messages for those they were carrying, and sent them on to deceive the enemy. Arabic writers attribute to the perfection of a system of pigeon posts elaborated by the Mohammedan sovereign Nureddin a large part of his success in welding together the scattered parts of his broad Empire. Although their use, publicly and as an amusement, continued, it was not until the Franco-Prussian War of 1870 that pigeons were again of conspicuous public service. During the siege of Paris constant communication between the beleaguered city and the outside world was obtained by this means, microphotographs of military despatches, private letters, and even newspapers, being printed upon films of collodion and carried by the birds—as much as 30,000 words in some instances. These would then be enlarged by photography and made legible. Subsequently the German, French, and other European governments established regular pigeon corps in the intelligence departments of their armies and navies, and thousands of birds were trained, and many continue to be kept for use as messengers. Experiments were made extensively by the French in the employment of pigeons at sea. It was found that they bore voyages well and would fly from a distance of more than 300 miles to shore stations with great accuracy, but

that they could not be depended on to go from snip to ship. In 1897 many trials were made in the United States navy, especially by Admiral Sicard, and considerable success was attained. A similar news service was attempted by certain newspapers also in coöperation with some of the Atlantic steamship companies, but it was not long maintained.

The flight of one of these birds is steady, direct, and rapid, but the rate of speed has been exaggerated and is now known to be on the average only about 30 miles an hour and rarely 45 miles. It begins with a spiral flight upward as soon as the bird is released from its confinement (usually in a portable dark basket), which is continued to a sufficient height to enable the bird, searching the horizon, to catch sight of some landmark with which it has previously been made familiar. Its memory in this respect is marvelous, and it may be assisted by that instinctive faculty for direction which seems innate in many wild animals. (See MIGRATION OF ANIMALS.) It then directs its course straight towards that point, when it will sight another landmark and so proceed from known place to place until it reaches home. Many societies in various parts of the world are breeding these pigeons and perfecting their abilities, and 500-mile races are frequently run.

The pigeons are a family, Columbidae, of the charadriiform suborder Columbæ, which also includes the families Dididae (see DODO) and Didunculidae (or tooth-billed pigeons). The Columbidae are divided by structural features into subfamilies: 1. Gourinae, containing the gouras (see GOURA). 2. Peristerinae, containing such tropical groups as the Nicobar pigeon, the wonga-wonga of Australia, the bronzewings, and several other robust, often terrestrial forms of the East and West Indies; also the ground doves of American warm latitudes, the scaly doves of the Andean region, the American mourning doves, together with the many species of turtle-doves of the Old World. 3. Columbinæ, the typical pigeons. 4. Treroninae, the fruit pigeons, in the widest sense, about 120 species, most of which are Oriental and African. See TOOTH-BILLED PIGEON.

Bibliography. P. J. Selby, *Illustrations of British Ornithology* (2 vols., London, 1825-33); J. M. Eaton, *Treatise on the Art of Breeding and Managing Tame, Domesticated, Foreign, and Fancy Pigeons* (ib., 1858); W. B. Tegetmeier, *Pigeons: Their Structure, Varieties, Habits, and Management* (ib., 1868); Robert Fulton, *Illustrated Book of Pigeons*, edited by Lewis Wright (New York, 1876); A. T. Salvadori (comp.), "Catalogue of the Columbæ or Pigeons," in *British Museum Catalogue of Birds*, vol. xxi (London, 1893); A. H. Evans, "Birds," in *Cambridge Natural History*, vol. ix (New York, 1900); Charles Darwin, *Variation of Animals and Plants under Domestication* (authorized ed., 2 vols., ib., 1900); E. G. Twombly, *The Pigeon Standard* (Boston, 1900); G. E. Howard, *The Homing Pigeon* (Washington, 1901); Charles Darwin, *Origin of Species by Means of Natural Selection* (from 6th Eng. ed., New York, 1906); W. B. Mershon (ed.), *The Passenger Pigeon* (ib., 1907); Stewart-Baker, *Indian Pigeons and Doves* (London, 1913); Alice MacCleod, *Pigeon Raising* (New York, 1913); E. C. Rice, *The National Standard Squab Book* (Boston, 1914).

PIGEON BERRY. The fruit of a perennial herb. See PHYTOLOCA; POKE.

PIGEON ENGLISH. See PIGEIN ENGLISH.
PIGEON FLYING. The art and practice of training and coursing carrier and homing pigeons, according to the rules of societies which exist for the promotion of competitive races. See PIGEON.

PIGEON HAWK. A falcon (*Falco columbarius*), inhabiting the cold and temperate parts of America. It is from 12 to 14 inches in length, with a spread of wing, in the female, of 2 feet to 26 inches. The male, as is usual with falcons, is smaller. In the adult the back is of a bluish-slate color, every feather having a longitudinal black line. The throat, breast, and belly are pale pinkish or yellowish white, each feather with a longitudinal line of very dark brown. The quills are black, with ashy-white tips; bill blue, legs reddish yellow with dark lines. It is the fiercest of all hawks in proportion to its size and lives mainly on small birds, such as pigeons, but rarely if ever attacks poultry. It breeds in the northern part of the continent, but passes the winter in the tropics. A familiar hawk of India, known to falconers there as turumti (*Falco tytus*), and an Ethiopian species (*Falco ruficollis*) complete this lively and interesting genus. Consult American and European ornithologies, especially A. K. Fisher, *Hawks and Owls of the United States* (Washington, 1893).

PIGEON PEA (*Cajanus*). A genus of plants of the family Leguminosæ, of which there is only one species (*Cajanus indicus*), a native of the East Indies, but much cultivated also in the West Indies and in Africa, where, as in other tropical countries, the plants annually drop their leaves and reproduce new ones with their flowers, when they are productive for several years. The seeds are among the most valuable tropical kinds of pulse. The plant is a shrub attaining a height of 4 to 10 feet when grown in favorable regions, although in cultivation it is generally treated as an annual. It grows either in rich or poor soils. Tested at the Louisiana Experiment Station, the pigeon pea was found very susceptible to frost and not well adapted to growing in the United States. In the tropics it has been found to be valuable as a temporary windbreak for young citrus plantings.

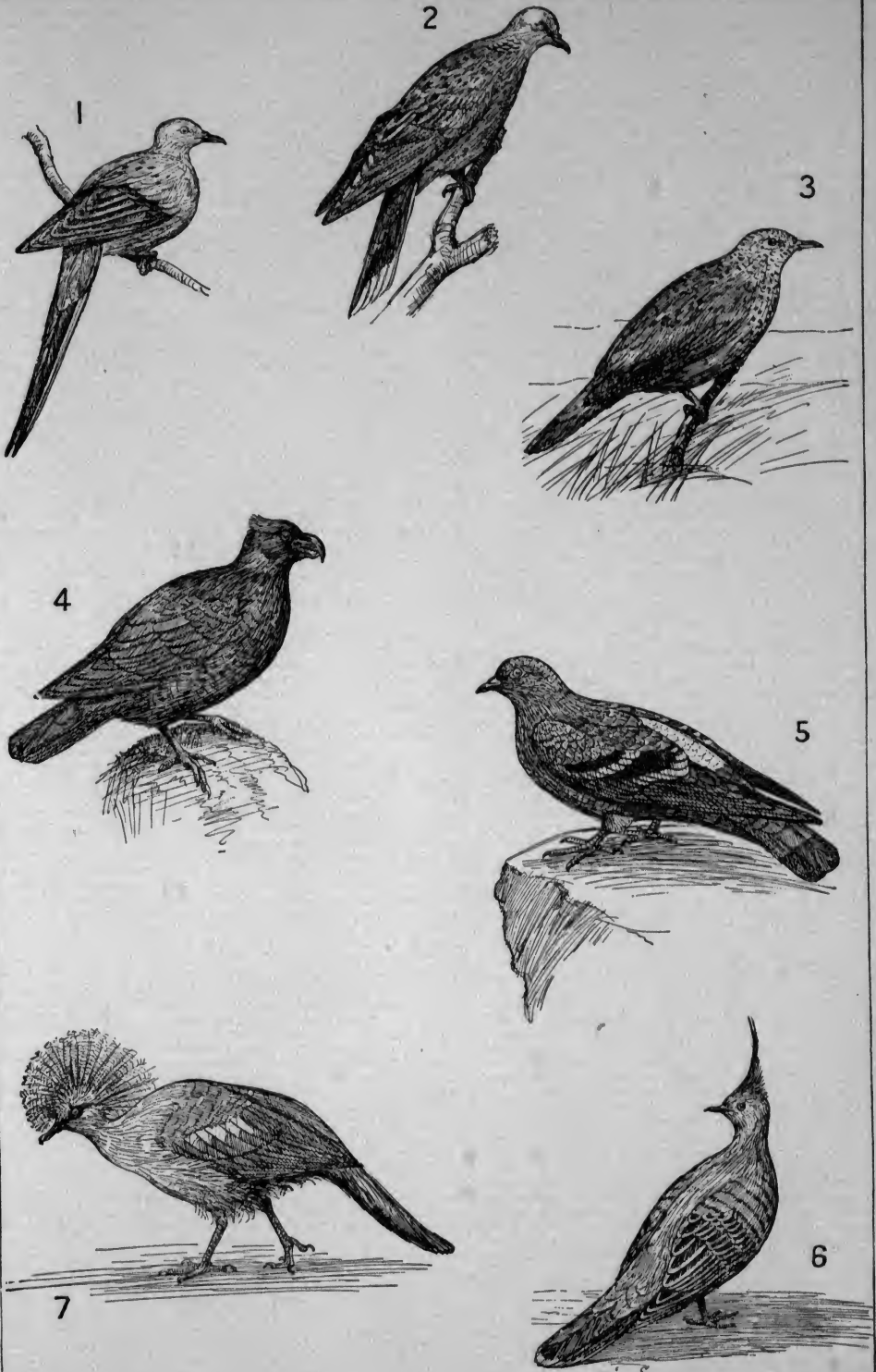
PIGEON PLUM. A Florida fruit. See SEASIDE GRAPE.

PIGEON TICK. See DOVE TICK.

PIGFISH. See SAILOR'S CHOICE.

PIGGOTT, pig'ot, SIR FRANCIS TAYLOR (1852-). A British legal scholar and Orientalist, born in Worthing, Sussex. He studied in Paris, at Worthing College, and at Trinity College, Cambridge, and was called to the bar in 1874. Afterward, as secretary, advocate, or judge, he became familiar with the government of Italy, Japan, and Mauritius. In 1905-12 he was Chief Justice of the Supreme Court of Hongkong, being knighted in the former year. Piggott's important works on law (especially international) and on the Far East include: *Foreign Judgments and Jurisdiction* (1879-81; 3d ed., 1908); *Exterritoriality and Consular Jurisdiction* (1892; 2d ed., 1907); *Bering Sea Letters* (1893); *Revised Laws of Mauritius* (1897; 2d ed., 1904); *Nationality and Naturalisation* (1904); *Extradition* (1910); *The Garden of Japan: A Year's Diary of its Flowers* (1892); *Music and Musical Instruments of the Japanese* (1893; 2d ed., 1909); *Huafeng Lao Jen, Letters on the Chinese Constitution* (1913).

PIGEONS



1. WILD or PASSENGER PIGEON (*Ectopistes migratorius*).
2. EUROPEAN TURTLE-DOVE (*Streptopelia turtur*).
3. GROUND-DOVE (*Columbigallina passerina*).

4. TOOTH-BILLED PIGEON (*Didunculus strigirostris*).
5. BLUE ROCK PIGEON (*Columba livia*).
6. CRESTED BRONZEWING (*Ocyphaps lophotes*).
7. CROWNED PIGEON (*Goura coronata*).

FIG IRON. See IRON AND STEEL, METALLURGY OF.

FIGLHEIN, pē'g'l-hin, BRUNO (1848-94). A German painter. He was born at Hamburg, and after studying sculpture there and at Dresden took up painting under Pauwels at Weimar and Diez in Munich. He became widely known through his religious composition "Moritur in Deo" (1879, National Gallery, Berlin), representing Christ on the cross kissed by the Angel of Death. Soon afterward he began to cultivate the pastel and depicted fashionable ladies, rōués, masked figures, and dancers, with Parisian spirit and audacity, but he also executed many refined portraits of women and children and scenes from child life, of which his "Idyl" (child and dog snugly seated by the water) became widely familiar through reproductions. His paintings are essentially pictorial in conception and show great taste, originality, and imagination. An "Entombment" (1888) is in the New Pinakothek at Munich, which also contains the impressive "Blind Maiden Going to the Well" (1890). Piglhein was one of the founders of the Munich Secession.

PIGMENT (Lat. *pigmentum*, from *pingere*, to paint; connected with Skt. *piś*, to adorn). In animals, the coloring granular matter in certain cells of the covering layer of the body ("dermis" of vertebrates, "epidermis" of arthropods). In mammals and in man the pigment is brown or nearly black, that of the retina of the eye very black and abundant, and is always situated in cells of the Malpighian layer, which lies between the epidermis and derma; in amphibians the pigment is accumulated mostly in the derma, partly diffused, and partly inclosed within the cells. In birds, the skin being very thin and concealed by the feathers, the coloring matter is mainly confined to the feathers. The principal pigments are: Zoömelanin, the black animal coloring matter, distributed in amorphous little corpuscles, insoluble in water, alcohol, acid, or ether, but dissolved and destroyed when boiled in caustic potash and then treated with chlorine; it consists of about 53.5 per cent of carbon, 4.6 of hydrogen, 8.2 of nitrogen, and 32.7 of oxygen. Zoöerythrin, red, hitherto found in the red feathers of the cotinga, flamingo, ibis, cockatoo, cardinal, and others, and in the "rose" around the eyes of the grouse. It is soluble in ether, alcohol, and chloroform, but not in acids or in potash. Zoöxanthin, yellow, can be extracted by boiling in absolute alcohol and is a diffused pigment which tinges the shafts, rami, and radii of the feathers and is possibly the same in the yellow feet and bills of birds of prey and ducks; like zoöerythrin, it is a colored fatty oil. Turacin is a most peculiar pigment, detected in the red feathers of the Musophagidæ, and seems to be restricted to these birds. It consists of the same elements as zoömelanin with the addition of from 5 to 8 per cent of copper. Such pigments appear in the coloring matter of birds' eggs. See Egg.

In insects the conditions are somewhat different, as the coloring matter is lodged not only in the scales but in the skin or crust of the body. The pigment in most insects, as well as in the lobster, is secreted in the deeper layer of the skin, under the cuticle, and this layer is called the epidermis. When the lobster casts its shell the soft epidermal layer consists of cells which are filled with red and blue pigment masses. This cellular layer gives rise to the outer cuticle,

which thus derives its hue, red and blue, from the deeper inner layer of color-secreting cells. In most insects the cuticle is nearly colorless or horn-colored or honey yellowish in tint.

PIGMENT. See PAINTS.

PIGMENT SPOTS, or EYES. See EYE, COMPARATIVE ANATOMY OF THE.

PIG'NUS (Lat., pledge). At Roman law, a pledge, i.e., something given to secure performance of an obligation. Originally, as to-day in English and American law, a pledge could be created only in corporal things and only by giving possession, and it conferred no right upon the pledgee except that of retaining possession until the debt was paid. Power of sale in case of the debtor's default was first introduced by contract, but eventually the power of sale became part of the general law of pledge. Pledge of a claim against a third person (*pignus nominis*) was also recognized, a quasi possession of the pledgee being established by notice to the pledgor's debtor. Before the close of the republican period the pledge of a thing had become independent of possession; it could arise by mere agreement, and such a contractual lien was enforceable against third persons. With this change *pignus* and *hypotheca* (see HYPOTHECA) became virtually the same thing. In the Justinian law *pignus* designates a pledge or mortgage of movable property or of a debt, while *hypotheca* designates a mortgage of immovable property.

Pignus could be established not only by contract but by will. It could also be established by levy on property in execution of judgment, and it was created in some cases by direct operation of law, as in the case of the landlord's lien on the effects brought in by the tenant.

Modern civil law recognizes, as a rule, no pledge of movables without possession. See BAILMENT; PROPERTY.

PIG'NUT. See EAETHNUT.

PIGOTT, pig'ot, RICHARD (?1828-89). An Irish journalist and forger. He passed a checkered career on several Dublin newspapers. In 1879 he was proprietor of three newspapers, which he soon sold to the Irish Land League, of which Parnell was president. Hitherto a violent Nationalist, Pigott now began to vilify his former associates and to sell information to their political opponents. His famous transaction was with the Irish Loyal and Patriotic Association, founded in 1886, to resist home rule for Ireland. Consult James O'Connor, *Recollections of Richard Pigott* (London, 1889). See PARNELL, CHARLES STEWART.

FIGRES, pī'grēz (Lat., from Gk. Πίγρης). A Greek poet of the fifth century B.C., supposed to have been the brother or the son of Queen Artemisia of Caria. According to Suidas and Plutarch he wrote a poem entitled *Μαργίτης* (see MARGITES), and he is now generally regarded as the author of the mock-heroic poem *Batrachomyomachia* (q.v.). Figres is said to have been the first poet to introduce the iambic trimeter. Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

FIG'S FACES. See MESEMBRYACEÆ.

FIG-TAILED BABOON. A small black baboon-like monkey, of Celebes Island (*Cynopithecus niger*), which has a rudimentary tail.

FIG-TAILED MONKEY. Either of two species of East Indian macaques, remarkable for their short curling tails. The best known is

the short-haired one (*Pitheous*, or *Macacus nemestrinus*), described by Buffon as the "maimon," which inhabits the Malay Peninsula and is found southward through Sumatra and Borneo. It is as large as a mastiff and has great strength; it was long ago related of it that the Sumatrans trained it to climb trees and throw down coconuts, but it is now believed that if this were ever true it must have been so only of females or young, as the old males become very fierce and unruly.

The Burmese pig-tailed monkey (*Macacus leoninus*, or more correctly *Pithecus andamanensis*) is distinguished by its longer hair, smaller size, and darker color. It has a limited distribution, is rare, and little known. See Plate of MONKEYS OF THE OLD WORLD.

PIGWEED. A name given to various species of *Amaranthus* (see AMARANTH) and often also to certain species of *Cycloloma* and *Chenopodium* (q.v.).

PIKA (adapt. of *piika*, Siberian Tunguese dial. native name). The popular name of the curious little duplicidentate rodents of the genus *Lagomys*, related to hares and rabbits, but representing a distinct degenerate family, the Lagomyiidae. They are sometimes called calling hares, little chief hares, and conies. They are about the size and shape of a guinea pig and are not superficially at all like the hares, except about the nose, though the rounded ears are large and the tail very short. Three species at least are known—one in Europe and Asia, a second in Asia, and the third in the mountainous parts of the western United States. The latter (*Ochotona princeps*) is 7 inches long, the tail less than an inch. It is dark grizzled blackish above and dirty whitish beneath. It inhabits the higher parts of the mountains, generally just above the timber line. The pikas are somewhat gregarious, and numbers usually inhabit masses of rocky debris at the base of cliffs, where their squealing note makes their presence known. They are timid, unsuspicious, and perfectly harmless animals. They feed entirely upon vegetable matter and store up hay and dried vegetables—which they cut and lay in the sun to cure—as bedding and fodder for the winter. See Plate of HARES AND PIKA.

PIKE (so called from its sharp snout and slender shape). The name of any one of several species of soft-rayed fishes of the family Lucidae (or Esocidae). They have an elongated body, slightly compressed posteriorly and covered with scales. The head is long, with a prolonged and depressed snout. The mouth is large, the lower jaw somewhat the longer, and well supplied with strong, sharp teeth. The dorsal and anal fins are inserted far back. There is a single genus, *Lucius* (Esoc), with six species all restricted to the northern part of North America except one species (*Lucius lucius*), which is found also in northern Europe and Asia. This, the "common" or English pike, grows to a length of about 4 feet. The "general color is bluish, or greenish gray, with many whitish or yellowish spots . . . arranged somewhat in rows; the dorsal, anal, and caudal fins with roundish or oblong black spots." It is called both pike and pickerel in the United States. The greatest of the American pikes is the maskinonge (q.v.), of the Great Lakes, which differs little from the European species. The remaining species are described under PICKEREL.

All the pikes are known for their voracity and

are hated by fish culturists because of their inroads on other more desirable species. A pike willingly attacks any fish of its own size and preys freely on the smaller ones, even of its own species. Frogs are frequent prey; water rats and ducklings are sometimes devoured. They spawn in spring in grassy shallows of the rivers and weedy waters in which they live, laying many thousands of eggs, which remain entangled in the vegetation until they hatch. The young pikes grow with great rapidity and in England are known as jacks, or pickerels. The Scottish name is gedd, a term similar to those in the Scandinavian languages.

The pike is caught by means of nets, by the rod, by set lines, and by trimmers or jiggers, which may be briefly described as floats with lines attached to them, the line being so fastened that the bait swims at a proper depth and that some yards of line may run out when the bait is taken. In angling for pike various baits are used, such as a minnow, a portion of a fish, etc., and sometimes an artificial fly is employed with success. These are English methods. In the United States a commoner method is by trolling with a spoon bait. They are much caught also through the ice of the northern lakes. See Colored Plate of AMERICAN GAME FISHES, accompanying article TROUT; and Plate of NEEDLE-FISH, PIKES, ETC.

Various other fishes are often called pikes, as the gars (see GAR), and pike perches (see PIKE PERCH). The Sacramento pike (q.v.) is a chub; the picuda is a barracuda.

PIKE (AS. *pis*, OF. *pique*, *picque*, Fr. *pique*, pike). A weapon of warfare used extensively till the introduction of the bayonet. Among ancient armies the Macedonians were famous for their spear or pike men, who carried weapons fully 24 feet long, while among comparatively modern armies pikes averaged a length of 12 to 14 feet. They were of stout wood and were tipped with a flat-shaped iron spearhead, which sometimes had cutting edges. At the other end was a spike for sticking in the ground. As a defense against cavalry the pike, from its length and rigidity, was of great value; but though it survived the introduction of gunpowder, that event was really fatal to it. The use of the words "pike" and "pikeman" to describe infantry armed with this weapon dates from the fifteenth century. In pike formations a depth of several men was essential, but the growing use of artillery rendered this impossible. For the transition from pike to bayonet, see BAYONET. See also INFANTRY.

PIKE, ROBERT (1616-1706). An American colonist, born in England. He emigrated to America with his father, John Pike, in 1625 and settled in Newbury, Mass. Four years later he removed to the farm at Salisbury which was his home for the remainder of his life. He early became a man of prominence in the Colony, was major of the local militia, and from the time he was 28 years old until his death, with the exception of three years when he was at odds with the General Court, he held political office, being for a long time a member of the General Court itself and later of the Board of Assistants. He was chiefly remarkable, however, as the representative of the first advocates in America of the people's right to free speech, to petition and to criticize their legislative bodies, and to demand acquittal in a court of law when not confronted with conclusive evidence. Though strictly

orthodox in his own beliefs, he defended the right of the Quakers to the free expression of their views and criticized the General Court for its action against sectarians. For this he was disfranchised by that body. Though he believed in the possibility of witchcraft, he protested against the admission of "spectre testimony" at the trials of supposed witches. Several were condemned in the towns about Salisbury despite his labors in their behalf, but, probably because of his influence, none were executed; and so this little group of villages was saved from sharing in the notoriety of Salem.

PIKE, WALL-EYED. See **PIKE PERCH.**

PIKE, ZEBULON MONTGOMERY (1779-1813). An American soldier and explorer, born in Lambertton, N. J. He was taken by his father, an army officer, to Bucks Co., Pa., and then to Easton. At the age of 15 he was a cadet in his father's regiment, became ensign March 3, 1799, and was made first lieutenant Nov. 1, 1800. On Aug. 9, 1805, he started from St. Louis on an expedition to reach the sources of the Mississippi and was successful, returning in April, 1806. He started on another expedition on July 1, ascended the Missouri River and the Osage into the present State of Kansas, and thence proceeded south to the Arkansas River. He ascended this to the present site of Pueblo, Colo., viewed Pike's Peak (named in his honor), and then went to the site of the present Leadville. While searching for the Red River, he reached the Rio Grande on Spanish territory and was sent under guard by the Spanish Governor of New Mexico to General Salcedo at Chihuahua. After some delay he was escorted to the boundary and on July 1, 1807, reached Natchitoches. He had been made captain in 1806 and was promoted to be major in 1808, lieutenant colonel in 1809, and colonel in 1812. On March 12, 1813, he was nominated brigadier general (though he was not confirmed by the Senate before his death) and was assigned to the principal army as adjutant and inspector general. In the expedition against York (Toronto), Upper Canada (Ontario), he landed on April 27 and stormed one of the redoubts. The retreating garrison blew up the magazine, and a falling piece of rock crushed his spine so that he died within a few hours. Consult the valuable *Expedition of Zebulon M. Pike to the Headwaters of the Mississippi, through Louisiana Territory, and in New Spain* (3 vols., New York, 1895), which contains Pike's own text (first published in 1810) rearranged, with full notes and an elaborate memoir by Elliott Coues.

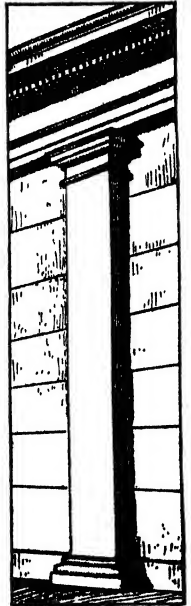
PIKE PERCH. The name given in America to a genus of perches, *Stizostedion*, and in Europe to species of a very nearly related genus, *Lucioperca*, because of their rather elongate body and the resemblance of the snout to that of a pike. They are true perches and inhabit the lakes and streams of Europe, western Asia, and eastern North America. There are several species in each genus, and all are important food fishes. They are usually under 2 feet in length, but *Lucioperca sandra* of Europe may reach a length of 4 feet, and *Stizostedion vitreum* of America a length of 3 feet and a weight of 20 pounds. The latter is a fish of many names in the United States, wall-eyed pike being perhaps the most widespread and familiar—a name, like white eye and glass eye, given because of the prominent eye; dory, yellow or blue pike, and jack salmon are other local

names. It is brassy olive in color, with the lower jaw, belly, and lower fins pinkish. It is scattered in favorable waters all over the North-western States and the Mississippi valley and is caught both in nets and by angling.

A second species (*Stizostedion canadense*) is more northerly in its distribution and is known as sauger and sand or gray pike. It is particularly a fish of the Great Lake region and has a more cylindrical form and more spotted fins than the wall-eyed pike, from which it may also be distinguished by absence of the jet-black spot over the hinder spines of the dorsal fin. See **Plate of PERCHES.**

PIKE'S PEAK. A famous peak of the Rocky Mountains, in El Paso Co., Colo., about 6 miles west of Colorado Springs (Map: Colorado, D 3). It was discovered in 1806 by Lieut. Zebulon M. Pike (q.v.). It was successfully scaled by a party led by Major S. H. Long in 1819, and in 1891 a rack and pinion railroad to the summit was opened, where a searchlight was installed in 1905. Its height is 14,108 feet above the level of the sea, and it commands a magnificent and widely extended view of the great plains and of a rugged mountainous country, containing many lakes and rivers. Though several mountains in the State are higher, none perhaps has a more majestic and commanding appearance. Conifer forests cover the slopes to a height of 11,700 feet, above which the mountain consists of bare granite rocks.

PILASTER (ML. *pilastrum*, little pillar, dim. of Lat. *pila*, pillar). An architectural member consisting of a vertical strip projecting slightly from the face of a wall, having a base and capital corresponding to those of a column and supporting an entablature. It occurs chiefly in the classic and Renaissance styles, but is found also in mediæval and Oriental buildings. In Greek architecture it was called *antæ*; in Roman buildings, as in Greek, the pilaster usually responded to a column, but it was sometimes used independently on the flanks and corners of temples, triumphal arches, etc., especially in Syria. In late examples it was sometimes adorned with richly carved arabesques instead of flutings. The decorative pilasters of the early Italian Renaissance were the most charming works of their class and, though inspired from Roman art, were more profusely used than in any other style. See **ORDERS OF ARCHITECTURE.**



PILATE, pi'lât, ACTS OF. See **APOCYPHA, New Testament.**

PILATE, ARCH OF. An arch spanning the Via Dolorosa at Jerusalem, said to mark the spot where Jesus with the crown of thorns was presented to the Jews by Pilate with the words "Ecce Homo." The structure is probably a Roman triumphal arch.

PILATE, PONTIUS (Lat. *Pontius Pilatus*, Gk.

Πόντιος Πειλάτος, Pontios Peilátos, the second and third of his three Roman names, the first being unknown; neither name is of certain derivation). The fifth in the series of Roman governors of the territory comprising Judæa, Samaria, and a large part of Idumæa, which, after the deposition of Herod Archelaus in 6 A.D., became an Imperial province. His official title was procurator, and he resided at Cæsarea, going up to Jerusalem at the season of national feasts with a band of soldiers, primarily to provide against possible disorder. His duties were both administrative and military, giving him complete judicial authority except in cases of Roman citizens, who had the right of appeal to Rome. In cases of extreme necessity he was subordinate to the Governor of Syria, but practically his control of his territory was absolute. Pilate's term of service in Palestine was from 26 to 36 A.D., extending from the appearance of John the Baptist, through the ministry of Jesus, and the early years of the Church. His administration was marked by strained relations between himself and the Jews, whose intense religious convictions and national pride he failed to understand. He was thoroughly hated by the people and finally, on their complaint, was recalled to Rome. Before his arrival the Emperor (Tiberius) died, and nothing is known, beyond untrustworthy tradition, of Pilate's fate. Pilate's place in history is chiefly in connection with the trial and death of Jesus Christ. After the Sanhedrin had condemned Jesus to death they came to Pilate, evidently expecting that he would ratify their decision without investigation (John xviii. 28-31). This, however, he refused to do. The Jews therefore presented charges of corrupt teaching, interference with tribute, and false claims of kingship against Jesus, which brought him within the sphere of civil law (Luke xxiii. 2-5). Pilate examined him privately and Jesus answered his questions frankly (John xviii. 33-38; xix. 9-11). As a result of the examination Pilate was convinced that Jesus was criminally guiltless and politically harmless and made an effort to save him, but he feared to do so by peremptory release (Luke xxiii. 4-7, 13-22; John xviii. 38-xix. 4, 12). In the end popular clamor prevailed, and personal and political considerations of a selfish nature outweighed Pilate's loyalty to the functions of a just judge (John xix. 12-16). As to Pilate's character and further career there is considerable material to be found in the apocryphal *Acts of Pilate* (fourth or fifth century) and the *Gospel of Peter* (second century). There is a so-called report of Pilate to the Emperor on the trial and sentence of Jesus contained in various ancient works (e.g., *The Acts of Peter and Paul*); also legends as to his death (e.g., Eusebius, *Hist. Eccles.* ii, 7). The Coptic church has canonized him. Consult, besides the lives of Christ: G. A. Müller, *Pontius Pilatus der fünfte Prokurator von Juddäa* (Stuttgart, 1888); Emil Schürer, *History of the Jewish People in the Time of Jesus Christ* (Eng. trans., New York, 1896); A. T. Innes, *Trial of Jesus Christ* (Edinburgh, 1899); G. Rosadi, *The Trial of Jesus* (London, 1905).

PILATO, LEONZIO. See LEONZIO PILATO.

PILATUS, LEO. See LEONZIO PILATO.

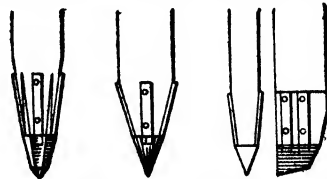
PILATUS, pi-lä'tus, MOUNT. A peak of the Bernese Alps in Switzerland, 6 miles south of Lucerne, rising from the west shore of the

Lake of Lucerne (q.v.) to a height of 6998 feet (Map: Switzerland, C 2). It is visited by numerous tourists on account of the fine view to be had from the summit, which is reached from Alpnach by a rack and pinion railroad. The name is probably a corruption of *pileatus* (capped), but according to a legend it is derived from Pontius Pilate, whose body is supposed to have been thrown into a little lake at the foot of the mountain, and whose ghost, as the legend goes, still haunts the place.

PIL/CHARD (formerly also *pilcher*, from Ir. *pilseir*, pilchard). A European fish (*Clupea pilchardus*), closely allied to the herring and the same thing as the sardine, sardines being simply young pilchards. (See **SARDINE**.) The pilchard occurs in vast schools along the western coast of Europe and in the Mediterranean Sea and is taken by means of seines in enormous quantities for the European markets and canning factories. It reaches nearly the size of the herring, but is rather thicker, and the outlines of the back and belly are straighter; the upper part of the body is bluish green, the sides and abdomen silvery white, the cheeks and gill covers yellowish, and the dorsal fin and tail dusky. In Great Britain it is caught only along the Channel Coast. See Plate of **HERRING AND SHAD**.

PILCOMAYO, pël'kô-mä'yô. A river of South America, the longest tributary of the Paraguay River (q.v.). It rises in the Cordillera Real in west Bolivia and flows with no large deviations southeastward until it joins the Paraguay just below Asunción (Map: Paraguay, II 2). In the lower half of its course it forms the boundary between Argentina and Paraguay. After descending from the Bolivian plateau and breaking through several ridges, it flows for the remainder of its course through the great plain of the Gran Chaco, partly through dense forests, partly through wide marshy tracts, where the banks are submerged, and where the river divides into several parallel channels. It is here a sluggish stream with an average width of 30 yards and so shallow and obstructed as to be almost completely unnavigable. The Pilcomayo has not yet been thoroughly explored, and its length is undetermined, but is estimated at 1200 miles.

PILE (AS. *pil*, from Lat. *pilum*, javelin, pestle, from *pisere*, to pound). In engineering and architecture, a long post, generally

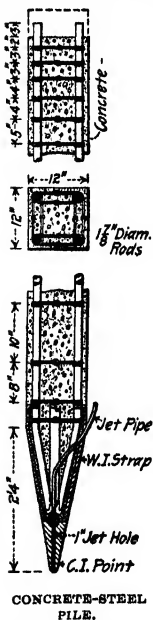


METAL SHOES FOR WOODEN PILES.

of wood but often of iron or concrete, driven into soft soils to support a load or to form an inclosure against the entrance of water. Piles are known by different names, according to their character or use, as bearing pile, sheet pile, screw pile, and disk pile. The most common form of bearing pile is usually a roughly trimmed, slender tree trunk or, less usually, a squared or other dressed timber shape. The woods used for piles are spruce and hemlock for soft soils, pines, elm, and beech for firmer soils, and oak

for compact soil. Engineers usually require that piles shall not be less than 10 inches in diameter at the smaller end. Generally the pile is shaped for driving, and sometimes a pointed iron shoe is attached to the pointed end; the top is frequently bound with an iron band to prevent brooming.

The machines used to drive piles by a falling weight or hammer are known as pile drivers. There are two general forms of such machines, known as drop-hammer and steam-hammer pile drivers. In a drop-hammer pile driver a heavy hammer of iron is pulled to the top of a frame by hand or power and allowed to fall freely on to the pile. The frame consists of two uprights called leaders, about 2 feet apart and from 10 to 60 feet high, which guide the falling weight. These leaders are usually braced back to the pile-driver platform by diagonal timbers. The sides of the hammer are grooved to slide between the leaders, and it weighs from 500 to 4000 pounds, usually about 2000 pounds. It is hauled to the top of the frame by a rope or chain attached to its top and passing over a pulley at the top of the frame, thence to a hand windlass or the drum of a hoisting engine. In one kind of pile driver the rope is attached to the hammer by means of a nipper or block with a sort of tongs, which are automatically opened by a tripping device when the top of the frame is reached, thus allowing the hammer to fall. In another form the rope is permanently attached to the hammer, which is set free by loosening a friction clutch, thus allowing the drum to unwind the rope, which is pulled down with the hammer. The latter form of driver is the one least commonly used and is the most expensive in first cost, but is

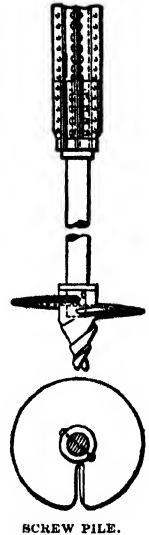


driver strikes blows having much less energy than those of a drop-hammer driver, it strikes its lighter blows so much more rapidly that it compares favorably with the best friction drum drop-hammer drivers in efficiency.

The two other forms of pile drivers are the gunpowder driver and the water-jet driver. The

gunpowder driver is seldom used and is worthy of mention chiefly for its novelty. The water jet is not strictly a pile driver but it is so well known a method of pile driving that it merits mention here. The method is very simple; a jet of water is forced into the soil just below the point of the pile, thus loosening the soil and allowing the pile to sink either by its own weight or with very light blows. The water is conveyed to the point of the pile by a hose, which is held to the pile by staples during sinking and pulled up to be used again after the pile is sunk. The water jet is effective in clear sand, mud, or soft clay, but is not used with any advantage in gravel, hard clay, or sand containing much gravel.

Piles sunk by the methods just described support their loads partly by the friction of the soil on the sides of the pile and partly as a column by the point resting on an impenetrable material. There are two methods of determining the supporting power of a pile: (1) to note its resistance to penetration under the last blow of the pile-driver hammer, and (2) to load the pile and observe the weight that it will safely stand. The former method is the one in most general use, the latter being used simply as confirmatory evidence in doubtful cases. Valuable results are secured by loading several piles, and in some tests made by the New York City Dock Department in 1914 concrete blocks weighing 220 tons were used in a test of a cluster of 16 piles, each from 85 to 90 feet in length and driven in deep water and a very soft mud bottom. See FOUNDATION.



The two most common forms of iron piles are screw piles and disk piles. Sometimes the stem of such piles is of wood, while the screw and disk are of metal. Screw piles for engineering work usually have a shaft from 3 to 8 inches in diameter, with screws from 3 to 6 feet in diameter. They are driven by rotating the shaft just as an ordinary wood screw is driven, capstan bars being usually employed to secure the screwing motion, although hydraulic screwing devices have been occasionally employed. Screw piles will penetrate all ordinary soils. They are employed for foundations of beacons and buoys, small lighthouses, and for supporting light bridges. They are seldom used in the United States, but are commonly employed abroad. Disk piles are sunk by the water jet. At the ocean pier at Coney Island, New York (one of the rare American examples of their use), disk piles having wrought-iron shafts 8½ inches in diameter and disks 2 feet in diameter and 9 inches thick were employed. Some of these piles stand 17 feet in the sand and carry loads of more than six tons per square foot of disk.

Concrete piles are either molded before driving, in which case they must be of reinforced construction, or molded in position. If the pile is made before driving, it is provided with a cast-iron point at the bottom and a cushioned head if it is to be placed with a pile driver.

Of course if it is set by a water jet it is necessary either to provide an iron pipe, at the centre of the pile or mold it with a hole. In the reinforced pile illustrated the concrete consists of one part Portland cement, two parts sand, and three parts broken stone or gravel, while the reinforcement consists of four round steel rods, an inch or more in diameter, placed at the four corners of the pile, as shown in the sketch, and extending from the top to the bottom of the pile, where they are connected by iron wire to the pipe used as the water jet. At points about 1 foot apart, between the top and bottom, $\frac{1}{4}$ -inch round steel clips are placed to tie the rods together. The water jet is always used in driving piles of this description.

Of the different forms of piles molded in place there are four varieties employed extensively by engineers and worthy of mention. The Simplex pile consists of a hollow steel shell, which is driven into the ground to the desired depth and then filled with concrete, after which the shell is withdrawn and the molded concrete is in place. The shell may be driven by means of steel points which are left in place, or a hinged cutting edge is provided which can open as the exterior casing is pulled out. In some cases, as in very wet soil, a permanent casing of thin sheet steel is employed. The Raymond pile, generally formed with a large taper, as from a 20-inch butt to an 8-inch point, has a thin shell of steel driven into the ground by means of a collapsible driving core, which is removed, after which the shell is filled with concrete. In the Chenoweth pile wire netting is plastered with cement mortar or concrete and then formed into a cylinder which is available for driving by means of a water jet or otherwise. In the Gow pile a wrought-iron pipe is driven into the ground; then, after the material has been washed out, a frame made of angle bars loosely connected at the junctions is inserted and is revolved so as to form a bell-shaped space below the lower extremity of the pipe. This, when filled with concrete, gives an increased bearing area, while of course the concrete fills the main portion of the pipe proper.

The advantage of concrete piles lies mainly in their increased durability, especially when exposed to air or water, where wood is attacked by the teredo or other marine borers. A concrete pile is believed to be able to support as much weight as two or three wooden piles and is superior in that it does not have to be cut off below the water surface and obviates a more elaborate and extensive masonry structure, which need not begin as low as where wooden piles are used.

Sheet piling varies all the way from small planks to interlocking plates of steel and is used largely for a cofferdam to keep water from structural work in progress. The simplest sheet piles are thick planks sharpened and driven edge to edge, sometimes in two or more rows, while thick tongued and grooved planks may be employed, or the same effect secured by a compound structure or by the use of the so-called Wakefield pile, where planks 10 or 12 inches wide and 10 to 16 feet long are used. Sheet steel piles either may be built up from standard structural shapes, such as channels or I-beams, or there may be special forms, especially designed for this particular purpose. They were first employed in 1901 at Chicago, and their

use has cheapened the cost of cofferdam construction and also increased the depth to which such work may be carried economically. While wood sheet piles are limited by a depth of 30 to 35 feet, there is no such limit to sheet steel piles, and in many cases they are actually cheaper than wood. See BRIDGE; FOUNDATION; LIGHTHOUSE.

Bibliography. W. F. Paton, *Practical Treatise on Foundations* (2d ed., New York, 1909); I. O. Baker, *Treatise on Masonry Construction* (10th ed., ib., 1909); C. F. Marsh, *Concise Treatise on Reinforced Concrete* (ib., 1910); C. E. Fowler, *Practical Treatise on Sub-Aqueous Foundations* (ib., 1914); W. C. Foster, *Treatise on Wooden Trestle Bridges and their Concrete Substitutes* (ib., 1914); F. E. Kidder, *Architects' and Builders' Pocket-Book* (16th ed., ib., 1915).

PILE (AS. *pil*, from Lat. *pilum*, javelin, pestle). In heraldry (q.v.), one of the charges known as ordinaries.

PILE DRIVER. See PILE.

PILE DWELLING. See LAKE DWELLINGS.

PILES (from Lat. *pila*, ball), or HEMORRHOIDS. Small vascular tumors situated either within or on the verge of the anus. They consist of dilated veins containing either fluid blood or a solid clot covered with inflamed, infiltrated, or permanently thickened mucous membrane. They are termed internal when situated above or within the sphincter, external when below or outside it. Piles vary greatly in size and structure and in the symptoms they produce. They may be merely little knots of varicose veins in the submucous tissue; these may in time increase in size, be forced in and out during defecation, become inflamed and strangulated and even ulcerated and gangrenous. External hemorrhoids usually do not bleed; the internal variety, which extend above the sphincter for an inch or more, are soft, purple, irregular masses, and bleed readily when irritated by hardened fecal masses. Arterial piles contain, besides a large vein, arteries of some size. These bleed easily and freely, but are comparatively rare. Children are occasionally afflicted with capillary piles, small sessile tumors, which also bleed.

Hemorrhoids are caused by any circumstance which produces long-continued venous congestion in the rectum. Constipation, enlargement of the prostate gland, pregnancy, tumors of the uterus or its appendages, congestion or cirrhosis of the liver, certain diseases of the heart and lungs, sedentary occupations, and relaxing climate are a few of the causes. Overuse of strong cathartics and horseback riding are mentioned as factors.

The following are the general symptoms of this affection. The patient, after having experienced for a varying time a feeling of heat, fullness, and dull pain about the lower part of the bowel, becomes conscious of a foreign body in the anus and, on examination, discovers a small tumor, which either remains outside or is retracted, according as it originates without or within the sphincter. This tumor gradually increases, and others form around it, until a mass at length results as large as a pigeon's egg, or larger. In its ordinary indolent state the tumor has little sensibility and occasions comparatively little annoyance, but when inflamed it is exquisitely tender and is the seat of burning and stinging sensations, rendering the

evacuation of the bowels (and sometimes of the bladder also) difficult and painful. In women an inflamed pile may cause pain in the back and other anomalous symptoms. In severe cases the patient can neither stand nor sit with comfort and finds relief only in a horizontal position.

Piles may be prevented by active exercise, mild saline catharsis, a light, laxative, nonstimulating diet. These measures may also avail to cure or hold in abeyance the affection in its earlier stages and, with the exception of the first, are always indicated in conjunction with other means of treatment. Scrupulous cleanliness must always be observed. When inflamed, in addition to precautions, piles should be treated by absolute rest, warm fomentations, and the injection of cold water into the rectum several times a day. As the acute symptoms subside astringent and sedative lotions, such as lead water and laudanum and extract of hamamelis, may be applied. Internal piles that protrude must be pushed back; if they become strangulated, hot applications are to be used until reduction is possible. For the bleeding, which is sometimes severe, cold applications and injections usually suffice. Hemorrhoids occasionally become so troublesome as to make life a burden, and operation is the only measure that will bring relief. The tumors, if external, may be simply tied with ligatures at the base and cut off. Internal hemorrhoids are treated in various ways. They may be drawn down, ligated, and cut off in the same manner as external piles, or they may be ligated, incised, and the clot turned out, the stump being returned to the rectum; they may be clamped, clamped and crushed, injected with carbolic acid, or dissected out and excised. In persistent cases the whole pile-bearing area of mucous membrane may be dissected and removed and healthy membrane brought down to take its place.

PILEUS, *pīl'ē-ūs* (Lat., cap). The caplike top of a toadstool. See **BASIDIOMYCETES**.

PILE/WORT. An herb. See **RANUNCULUS**.

PIL/GRIM (OF. *pellegrin*, *pelerin*, *peregrin*, Fr. *pèlerin*, pilgrim, from Lat. *peregrinus*, foreigner, pilgrim, from *pereger*, being in foreign lands, from *per*, through + *ager*, field). One who visits some distant place for a religious purpose. The notion that particular localities possess special sanctity is widespread. The gods of primitive religions are local and can be approached only within their proper boundaries or at their peculiar sanctuaries. Hence, when their worshipers become scattered, a journey is necessary to offer devotion or ask for favors. A place where a theophany is supposed to have occurred is naturally considered as consecrated by the divine presence and particularly favorable for answer to prayer. Localities of importance in the history of a religion or in the lives of persons specially revered attract the interest and devotion of the faithful. In religions where self-mortification is considered meritorious or obligatory, the trouble and pains involved in a journey, particularly in times and places where travel is neither easy nor secure, have made of pilgrimage a meritorious act and pious duty. On the other hand, the journey affords opportunity to see the world, satisfies the love of adventure, and provides an outing, and this element is not to be overlooked in tracing the history of pilgrimage.

Pilgrimages are characteristic of many reli-

gions, as those of ancient Egypt, Persia in the Mithraic period, Syria, Mexico, Peru, India, China, and Japan. The Greek and Roman custom of consulting the gods at local oracles, like Dodona of Delphi, is well known. In the early period of Hebrew history there were many local sanctuaries, and pilgrimages to some of them are clearly indicated, as Shiloh (1 Sam. i. 4), Ophrah (Judges viii. 27), Dan and Bethel (1 Kings xii. 30-33). The great Mohammedan pilgrimage to Mecca (see **HAJJ**; **MOHAMMEDANISM**) is a survival of pagan times. Besides this, which is obligatory on every Mussulman, there are numerous devotional pilgrimages, particularly to the tombs of saints. Kairwan (q.v.) in Tunis, Wazan in Morocco, Kerbela (q.v.) in Mesopotamia, and Maajid Ali in Irak are sacred cities, the last two in the estimation of the Shiites hardly second to Mecca.

The early Christians regarded certain places with special religious interest; above all, the Holy Land and particularly the scenes of the passion of the Lord at Jerusalem. Other sacred places, too, were held to be fit objects of the same visits of religious veneration. The tombs of the apostles Peter and Paul, and of the martyrs in the catacombs at Rome, are so described by St. Jerome (*Commentary on Ezekiel*). The pilgrimage, however, preëminently so called, was that to the Holy Land; and even after Jerusalem had been occupied by the Mohammedans, the liberty of pilgrimage, on payment of a tax, was formally secured by treaty; and it was from the necessity of protecting pilgrims from outrage that the well-known military orders (see **ORDERS**) had their origin. The Crusades (see **CRUSADE**) may be regarded as a pilgrimage on a great scale, the direct object being to secure for the Latin Christians immunity of pilgrimage. On the other hand, the final abandonment of the Crusades led to a great extension of what may be called domestic pilgrimage and drew into religious notice and veneration many shrines in Europe, which after the lapse of time became celebrated places of pious resort. The chief places of pilgrimage in the West were: in Italy—Rome, Loreto (q.v.), Genazzano, Assisi; in Spain—Compostela, Guadalupe, Montserrat; in France—Fourvières, Puy, Saint-Denis; in Germany—Oetting, Zell, Cologne, Treves; in Switzerland—Einsiedeln; in England—Walsingham, Canterbury, and many others of minor note. The pilgrim commonly bound himself only by a temporary vow of chastity and other ascetic observances, terminating with the actual visit to the place of pilgrimage or at least with the return home. He wore a broad hat, a black or gray cloak girt with a cincture, and carried a long staff. Those who had completed the pilgrimage to the Holy Land brought away a palm leaf and hence were called *palmera*. A string of scallop shells was the badge of a pilgrim from Compostela, a bottle or bell from Canterbury. Pilgrims had many privileges. They were considered holy men whose person was sacred, and were entitled to entertainment and assistance on their way. Hospices for their accommodation were established in many places, notably Rome, and are a prominent feature of Jerusalem at the present day. In the course of time many unworthy persons joined the number and brought pilgrimages into disrepute. They have always been maintained in Italy, Spain, southern Germany, and Switzerland; in France they fell into disfavor during and after

he Revolution. In late years, however, pilgrimages on a very large scale, even from the United States, have visited the sanctuaries of Lourdes (q.v.), La Salette, and Paray-le-Monial (q.v.). Another popular European place of pilgrimage is Czenstochowa in Russian Poland. A famous shrine of the New World is Ste. Anne de Beaupré, near Quebec; and large numbers annually visit the place consecrated by the death of the Jesuit martyrs Father Jogues (q.v.) and his companions at Auriesville, N. Y. The Holy Land is visited still by many pilgrims from the Eastern churches, particularly Russian peasants, and a smaller number from western Europe. Quite another use is that which calls the first settlers in Massachusetts the "Pilgrim Fathers" (q.v.). Consult, for the history of Christian pilgrimages: J. Marx, *Das Wallfahren in der katholischen Kirche* (Treves, 1842); J. A. J. Jusserand, *English Wayfaring Life in the Middle Ages* (4th ed., London, 1892); T. R. Glover, *Life and Letters in the 14th Century* (Cambridge, 1901); L. Dupont, *Pèlerinages* (Paris, 1902); Khan and Sparrow, *With the Pilgrims to Mecca* (New York, 1905); M. M. Newett, *Canon Pietro Casola's Pilgrimage to Jerusalem in the Year 1494* (Manchester, Eng., 1907); S. H. Heath, *Pilgrim Life in the Middle Ages* (Boston, 1912); and for some of the most famous shrines: J. S. Northcote, *Celebrated Sanctuaries of the Madonna* (London, 1868); J. C. Wall, *Shrines of British Saints* (ib., 1905). A valuable series of pilgrim accounts is the publications of the *Palestine Pilgrims' Text Society* (13 vols., ib., 1897). For modern pilgrimages: Stephan Graham, *With the Russian Pilgrims to Jerusalem* (ib., 1913). See PILGRIM FATHERS.

PILGRIMAGE OF GRACE, THE. The name given to an uprising in the north of England in 1536. The destruction of the smaller monasteries by Henry VIII angered the country gentlemen and the Commons, who had taken great pride in these institutions and had received educational and other benefits from them. They feared, too, that after this work was done, Cromwell, the King's evil genius, would plunder even the parish churches. This was the chief grievance which drove 60,000 men of Lincolnshire to rebellion. Though they soon dispersed, a more formidable uprising in Yorkshire took place under the lead of Robert Aske, a gentleman and barrister. Priests encouraged the movement. The rebels, calling their march the Pilgrimage of Grace and carrying a banner embroidered with the five wounds of Christ, demanded a renewal of the connection with Rome, restoration of the monasteries, and punishment of Cromwell. As the King's forces could not cope with the insurrection, he promised to call a Parliament in the north to settle the grievances. The rebels thereupon returned to their homes; but, far from keeping his word, Henry not only put to death 20 leaders of the rebellion, but covered the whole north with gibbets. Consult C. S. Todd, *Incidents in the History of Kingstons-upon-Hull* (London, 1869), and A. F. Pollard, *Henry VIII* (New York, 1905).

PILGRIM FATHERS. A term used for the earliest immigrants to Massachusetts and more especially for the settlers at Plymouth in 1620. Governor Bradford, Cotton Mather, and others spoke of them as "pilgrims and strangers upon the earth." Before the beginning of the nineteenth century the term came to be used

as an appellation. A distinction should be made between the Pilgrims, who settled Plymouth, and the Puritans (q.v.). The Puritans sought the reform of the Church of England. The Pilgrims were Separatists from the first, who had already left England and formed an independent congregation in Leyden, whence they came to New England. They numbered 41 families, 102 persons, landing at Plymouth after a voyage of 63 days, on Dec. 20, 1620. They had previously made a covenant, known as the Mayflower Covenant, which bound them into a civil state upon a religious basis. They wished to found "a church without a bishop, a state without a king." In the reaction from the Church of England they laid aside all religious ceremonials, so that for a time marriages and funerals were conducted without religious services and public worship was stripped of all semblance of ritual. See CONGREGATIONALISM; MASSACHUSETTS; ROBINSON, JOHN.

Bibliography. Leonard Bacon, *Genesis of New England Churches* (New York, 1874); Edward Arber, *The Story of the Pilgrim Fathers, as Told by Themselves, Their Friends, and Their Enemies* (Boston, 1897); John Brown, *The Pilgrim Fathers of New England and their Puritan Successors* (New York, 1897); H. M. and Morton Dexter, *The England and Holland of the Pilgrims* (Boston, 1905); Winnifred Cockshott, *The Pilgrim Fathers: Their Church and Colony* (New York, 1909); W. E. Griffis, *The Pilgrims in their Three Homes* (rev. ed., Boston, 1914); F. M. Gregg, *Founding of a Nation* (ib., 1915).

PILGRIM'S PROGRESS, THE. A famous allegory by John Bunyan—the first part printed in 1678, the second in 1684. The first part describes the journey of Christian to the Celestial City; the latter, the journey thither of his wife, Christiana, and her children. This drama of the soul's progress through life was written in Bedford prison, probably in 1675-76, and not during Bunyan's earlier and longer imprisonment. The pilgrim idea of life was an old one, but never was worked out in so powerful a manner as by this humble Puritan, whose only helps were his Bible and Fox's *Book of Martyrs*. In its author's lifetime, *The Pilgrim's Progress* ran through 10 editions, and now the editions of it in English and in many other languages are unnumbered. It is still a living book and the greatest of allegories. Its appeal at first was to the lower and lower middle classes, and the numerous early editions, by the meanness of the paper, print, and illustrations, show that they were not designed for well-to-do or cultivated readers. Certain of the more austere Puritans, finding it beyond question pleasant and beguiling reading, began to distrust it as a vain romance. It is a curious fact, in this connection, that *The Pilgrim's Progress* leads on to the work of Fielding, Smollett, Sterne, and other novelists whom its Puritan author would have denounced as profane. In literary qualities it is a great book, expressing Bunyan's own aspirations and hopes, his reverence for the right, his human kindness, and his spiritual struggles. The story, of irresistible narrative interest, and written in the most vigorous and idiomatic English, is graphic in description and is enlivened by humor. Bunyan enlists the sympathies of his readers warmly on the side of virtues which, on the whole, the moral sense of the world to-day prizes as highly as did Bunyan himself.

PILGRIM'S TALE, THE. A poem erroneously attributed to Chaucer as one of the *Canterbury Tales*. A confused story was told of it by the son of Thynne, who edited Chaucer's works in 1532 and is said to have printed it. But it is not found in either of Thynne's editions. It appeared in *The Courte of Venus*, a collection of verse published about 1536, in which it is credited to Chaucer. Only two fragments of this work exist in Oxford, one of which contains the *Tale*.

PILID/TUM. See NEMERTINEA.

PILKINGTON, LETITIA (1712-50). An Irish adventuress, born in Dublin. She was the daughter of Dr. Van Lewen, an obstetrician, and married Matthew Pilkington, an Irish clergyman, in 1729. Jonathan Swift, then Dean of St. Patrick's, Dublin, was attracted by her vivacity and ingenious manners and helped her improvident husband to get a position in London. Afterward the pair were divorced, and Mrs. Pilkington lived in Ireland and England, befriended by Colley Cibber, Samuel Richardson, and others. Her *Memoirs* (1748) have been criticized as false, but they are written in an engaging style. Thackeray uses them freely in his *English Humourists*.

PILL (from Lat. *pilula*, abbreviated in mediæval prescriptions to *pil.*, pl. *pill.*, pill, little ball, dim. of *pila*, ball). Pills are globular masses of a size convenient for swallowing and of a consistence sufficient to preserve their shape and yet not so hard as to be difficult of solution in the stomach or intestines. They are especially suitable for remedies which operate in small doses, as the metallic salts; substances whose action it is desired to retard until they have reached the intestines; bodies whose specific gravity is too inconsiderable to allow their suspension in aqueous vehicles; and substances which are disagreeable to the taste or smell. The pill form is, on the other hand, unsuitable for medicines which it is necessary to give in large doses; fluid or semifluid substances, such as oils, balsams, etc., which require a very large proportion of some dry powder to make them into a mass; and substances so insoluble that when exhibited in solid form they pass through the intestinal canal unaltered, as extract of logwood. Many substances, such as vegetable extracts, may be at once formed into pills without any addition; but most of them require an excipient for converting them into a pill mass. The excipients in common use are soap, extract of licorice, mucilage, sirup, molasses, honey, castor oil, and confection of roses; the latter is probably the most generally useful, from its property of remaining soft for a considerable length of time. It is common to place pills in some fine powder to prevent them from adhering to one another and to conceal their taste. For this purpose licorice powder, wheat flour, starch, magnesia, and lycopodium are employed. Pills made in large numbers and by machinery are often coated with sugar variously colored and flavored, gelatin, keratin, and other materials. Fourteen pills are official in the *United States Pharmacopæia*, but numberless formulæ are compounded extemporaneously. The tendency of pills to become hard and insoluble with age has resulted in their replacement to a considerable extent by "tablet triturates," in which the ingredients are simply mixed with milk sugar and compressed into easily crumbling masses. A very large pill is sometimes called a bolus,

while very small pills are known as granules. See CAPSULE.

PIL/LAR (OF. *pilar*, *pilier*, Fr. *pilier*, from ML. *pilare*, *pilarius*, *pilarium*, *pilleare*, *pillar*, from Lat. *pila*, pillar, pier, mole). A term signifying properly a free-standing, independent columnar structure of considerable size, erected either for the sake of its appearance or to support a statue or other commemorative object. The term is loosely and incorrectly applied also to almost any support of masonry, round, square, or polygonal; more properly called column or pier, according to its shape.

PILLAR SAINT, or **STYLITE**. One of a remarkable class of ascetics, chiefly of Syria, who, with a view to separating themselves more completely from earth and fellowmen, took up their abode on the tops of pillars and remained thus without descending to earth, exposed to all the variations of climate or sheltered only by a hut built on top of the pillar. The earliest of these and the most celebrated was St. Simeon or Simon Stylites, a Syrian monk, who was born near the close of the fourth century and is said at first to have lived for 10 years in extreme seclusion in his monastery in the neighborhood of Antioch, without ever moving from his narrow cell. Increasing in enthusiasm, about 423 he withdrew from the monastery and built a pillar, on the top of which, only a yard in diameter, he took up his position. From this pillar he removed to several others in succession, each higher than its predecessor, till at last he attained 40 cubits, or about 60 feet in height. In this life he spent 37 years. Many remarkable stories are told of his austerities, and he acquired the reputation of a miracle worker. The fame of his sanctity brought crowds of pilgrims from the most distant countries to see him, and he is said to have converted many to the Church. A disciple of Simeon, named Daniel, succeeded to his reputation for sanctity and to his mode of life, which he maintained for 33 years, in the still more trying climate of the shores of the Bosphorus, about 4 miles from Constantinople. Another Simon Stylites (died 597) lived near Antioch and also had a great reputation for austerities and miracles. Still another lived, perhaps in the fifth century, in Cilicia. In Syria there were many pillar saints as late as the twelfth century; after the sixteenth century they disappeared altogether. In the West there is only a solitary example. A monk named Wulfraicus, near Treves, attempted the pillar life in 585, but the neighboring bishops compelled him to desist and destroyed his pillar. Consult the early lives of St. Simon, edited by Hans Lietzmann, in Harnack and Gebhardt, *Texte und Untersuchungen*, vol. xxxii (Berlin, 1906), and Hans Lietzmann, *Das Leben des heiligen Symeon Stylites* (Leipzig, 1908).

PILLARS OF HERCULES. See HERCULES, PILLARS OF.

PILLAU, pil'lou. A seaport town, fortress, and bathing resort of East Prussia, situated on the south end of a tongue of land separating the Frisches Haff from the Baltic Sea, at the entrance to the former and 29 miles west of Königsberg, with which it is connected by rail and by a navigable channel (Map: Prussia, H 1). It is the outer port of Königsberg. Pop., 1900, 2993; 1910, 7066.

PILL BEETLE. A beetle of the family Byrrhidae, a term used by English collectors. The group is a small family of 200 to 300 species, of

which about 40 occur in the United States. They are small insects, move very slowly, and when disturbed at once contract the limbs so completely that they look like inanimate objects.

PILL BUG. See ISOPODA; SOW BUG.

PILLING, JAMES CONSTANTINE (1846-95). An American ethnologist, born in Washington, D. C. He was educated at Gonzaga College in that city, and while with Major J. W. Powell (q.v.) on the Rocky Mountains Geological Survey (1872-79) had opportunity for studying aboriginal dialects. In 1879 he was appointed chief clerk of the Bureau of Ethnology, and in 1881 chief clerk of the United States Geological Survey. Pilling published a general bibliography, *The Languages of the North American Indians* (1885), and later a number on individual languages.

PILLNITZ, pil'nits. A palace and ordinary summer residence of the royal family of Saxony, in a beautiful situation, 6 miles southeast of Dresden. Pillnitz acquired a historic interest from the meeting of Leopold II and Frederick William II held in the castle in August, 1791, when the Declaration of Pillnitz was framed, in which Austria and Prussia affirmed that the affairs of King Louis XVI (then a prisoner in the Tuileries, after his ineffectual attempt to escape from France) were a matter of common interest to the sovereigns of Europe and expressed the hope that common cause would be made for his restoration. The Emperor and the King of Prussia were resolved to use force in order to effect this result; but any immediate interference on their part was rendered unnecessary by Louis's acceptance of the constitution as modified by the National Assembly, after which he was again placed on the throne.

PILLON, pē'yōn', FRANÇOIS (1830-1914). A French philosopher, born at Fontaines. He studied at the seminary of Auxerre, took part in the revolution of 1848, went to Paris in 1852, and became a doctor of medicine. He soon turned to philosophy and in 1867 founded, with Renouvier, *L'Année Philosophique*, which was interrupted by the War of 1870. It became the *Critique Philosophique*, but in 1890 was again published under its first title. In this new series (23 vols., 1890-1913) the most important work of Pillon is to be found. Especially notable was his annual 100-page critical résumé of important philosophical contributions. Besides translating Hume and Kant, whose influence on his own thought is evident, he contributed to the *Grand Dictionnaire Larousse* and published *La philosophie de Charles Secrétan* (1898). From 1900 to the year of his death he was annually awarded the Gegner prize by the Academy of Moral and Political Sciences. To Pillon William James dedicated his *Principles of Psychology*.

PILLORY (OF., Fr. *pilori*, from Prov. *espitlori*, pillory, from Lat. *speculatorius*, relating to an observer, from *speculator*, observer, investigator, scout, spy, from *speculare*, to view, from *specula*, watch tower, from *specere*, to see). An obsolete instrument of punishment. It consisted of two parallel boards, joined by sliding hinges and fixed like a signboard on the top of a strong pole, supported on a wooden platform elevated above the ground. A large circular hole with its centre in the line of junction of the two planks received the neck, and two corresponding holes of smaller size, one on each side of it, the wrists. The pillory existed in England before the Conquest, in the form of

the halafang or catch neck, an instrument by which the neck only was confined. By the "statute of the pillory" of Henry III it was made the instrument for punishing "forestallers, users of deceitful weights, perjury, forgery, etc.," and all such dishonorable offenses. Its use was confined to this class of offenders till 1637, when restrictions were put upon the press, and all who printed books without a license were put in the pillory. From this time it became the favorite mode of punishing libelers, authors and publishers of seditious pamphlets or of strictures on the government, and many eminent men suffered on the pillory. The inadequacy of the pillory as a means of inflicting punishment, however, became apparent, for to those who were popular favorites it was no punishment, while those who were objects of popular dislike were ill-used to such an extent as occasionally to suffer death. In France the pillory was anciently called *pilori*, and later *carcan*, from the iron collar by which the criminal's neck was attached to the post; but punishment by this mode was abolished in that country in 1832. It was in use in Germany also, where it was known as the *Pranger*. The pillory was abolished in England in 1837, and in the United States, where early statutes had provided for it for some offenses, in 1830. In Delaware, however, the punishment remained till 1905.

PILLOW, FORT. See FORT PILLOW.

PILLOW, GIDEON JOHNSON (1806-78). An American lawyer and soldier, prominent as an officer in the Mexican War and on the Confederate side in the Civil War. He was born in Williamson Co., Tenn., graduated at the University of Nashville in 1827, and began the practice of law in Columbia, Tenn., in the following year. He was commissioned brigadier general and placed in command of the Tennessee volunteers on the outbreak of the Mexican War in 1846. He served for a short time in the Northern campaign under General Taylor, then joined General Scott before Vera Cruz; commanded the right wing of the American army at Cerro Gordo, where he was severely wounded; was promoted to be major general in April, 1847; and participated in the battles of Contreras, Churubusco, and Chapultepec. After the war he was charged with insubordination by General Scott, but was honorably acquitted by a court of inquiry. He then returned to the practice of the law in Tennessee and took an active interest in politics. On the outbreak of the Civil War he entered the Confederate service and was appointed brigadier general. He was in command against Grant at the battle of Belmont on Nov. 7, 1861; was second in command at Fort Donelson under General Floyd, with whom he escaped on the night before the surrender to Grant by General Buckner (see FORT HENRY AND FORT DONELSON); was temporarily relieved from command; and subsequently served under Beauregard in the Southwest and acted as chief of conscripts in the Western Department.

PILLSBURY, HARRY NELSON (1872-1906). An American chess player, born in Somerville, Mass. A strong taste for mathematics early led him to the study of chess. At the International Chess Congress held at Hastings, Eng., in 1895, he won the world's championship over a group of famous experts, the first American since Paul Morphy to attain that honor. Thereafter, from 1896 to 1902, he played in seven international tournaments, in which he tied once for first

place, was second four times, third at Budapest (1896), and tied with Tarrasch for third and fourth the same year. By defeating J. W. Showalter in 1897 and 1898, he won the American championship, which he held at the time of his death. Pillsbury was the most remarkable "blindfold player" in the history of the game of chess.

PILLSBURY, JOHN SARGENT (1828-1901). An American miller and politician, born at Sutton, N. H. He received a common-school education and in 1855 settled at the Falls of St. Anthony, Minn., where he opened a hardware store. In 1872 he became a partner in the firm of Charles A. Pillsbury & Co., flour millers. From 1864 to 1876 he was a State Senator and from 1876 to 1882 was Governor. During his administration he persuaded the people to pay off the State debt, which they had repudiated 20 years before. He gave generously to the University of Minnesota and other public institutions, built a town hall for Sutton (his birthplace), and founded a library for workingmen in East Minneapolis.

PILLSBURY, PARKER (1809-98). An American abolitionist, born at Hamilton, Mass. He removed to Henniker, N. H., in 1814, about 1829 began to drive an express wagon between Boston and Lynn, afterward was a farmer, in 1835-38 studied at the Gilmanton (N. H.) Theological Seminary and in 1838-39 at the Andover Theological Seminary. In 1839 he was licensed to preach and in 1839-40 was pastor of the Congregational Church at New London, N. H. He then withdrew from the ministry, enlisted in the Antislavery movement, was for a short time editor of the *Herald of Freedom* at Concord, N. H., and then became a lecturer in New England and the West. In 1854 he visited England in the interest of the movement. He was fanatical in his views and violent in his methods. He joined Wendell Phillips in the meetings of the American Antislavery Society and elsewhere in opposition to the reelection of Lincoln. His attacks upon the Church, owing to the attitude of the pulpit towards Antislavery reformers, were particularly bitter. In 1868-70 he edited the *Revolution*, a New York journal advocating woman suffrage. Upon the dissolution of the American Antislavery Society, whose continuance for philanthropic work among freedmen he had urged, he became a preacher for free churches at Salem and Toledo, Ohio, Battle Creek, Mich., and other towns of the West. He published some pamphlets, including the text of a lecture, "The Plague and Peril of Monopoly" (1887); *Acts of the Anti-Slavery Apostles* (1884); *The Church as it Is* (1885). The *Acts* contains an autobiographical sketch.

PILLSBURY, WALTER BOWERS (1872-). An American psychologist, born at Burlington, Iowa. He studied for two years at Penn College, Oskaloosa, Iowa, graduated from the University of Nebraska (1892), and took his Ph.D. at Cornell (1896). Pillsbury taught at the University of Michigan after 1897, in 1905-10 as junior professor of philosophy and director of the psychological laboratory and afterward as professor of psychology. In 1908-09 he lectured at Columbia. He served as president of the Western Philosophical Association in 1907 and of the American Psychological Association in 1910. Besides contributing to the *American Journal of Psychology* and to the *Philosophical Review*, he translated, with E. B. Titchener, Külpe's *In-*

troduction to Philosophy (1897) and published *L'Attention* (1906; Eng. ed. as *Attention*, 1908; Span. trans., 1910); *The Psychology of Reasoning* (1910); *The Essentials of Psychology* (1911).

PIL/MOOR, JOSEPH (1739-1825). One of the founders of Methodism in America. He was born at Tadmouth, in the North Riding of Yorkshire, was educated at the Kingswood school, entered the ministry in 1765, and after coming to America in 1789 labored in New York and Philadelphia. He returned to England in 1774. Because he was not included by Wesley in the legal hundred he was offended and retired in 1785. Returning to America, he became a member of the Protestant Episcopal church and was ordained by Bishop Seabury the same year. He still ministered in New York and Philadelphia, the last 20 years of his life being spent as rector of St. Paul's Church in the latter city, where he died. His journal in manuscript is the property of the Methodist Historical Society of Philadelphia; a portion of this has been published by J. P. Lockwood as *The Western Pioneers* (London, 1881).

PILOBOLUS (Neo-Lat., from Gk. *πίλος*, *pilos*, ball + *βόλος*, *bolos*, a throwing). A genus of molds belonging to the Phycomyces (q.v.). It is abundant on stable manure and is remarkable for the method of dehiscence of its sporangium. These sporangium-bearing branches become very turgid and swollen just beneath the sporangium, and finally burst, hurling the sporangia with considerable force. This curious habit has given to the plant the common name, squirting fungus.

PILOCARPINE. See ALKALOIDS; JABORANDI.

PILOCERAS (Neo-Lat., from Gk. *πίλος*, *pilos*, wool, ball + *κέρας*, *keras*, horn). This genus of cephalopods, occurring in the lower Ordovician rocks of eastern North America, represents one of the most primitive types. It has a straight, short, rapidly expanding conch with a very large siphuncle and single camera surrounding the siphuncle on three sides. The best-known species is *Piloceras explanator* from the Beekmantown rocks of the Champlain basin. See CEPHALOPODA.

PILON, pə'lɒn', GERMAIN (c.1535-90). A French sculptor of the High Renaissance. He was born in the Faubourg Saint-Jacques, Paris, about 1535, as is known by a document of 1573. His father was a stonecutter, from whose instruction he passed to that of Pierre Bontemps. At the age of 23 he was engaged with Pierre Bontemps in the execution of a fine monument to Francis I in the church of Saint-Denis. In 1561 was undertaken the extremely important group in the Louvre of three Graces supporting a bronze vase, which formerly contained the heart of Henry II. After the year 1565 Pilon was much occupied with the decoration of the monument of Henry II in Saint-Denis, designed by Lescot. All the sculpture of this monument was formerly attributed to him, but it is now known that only the four principal figures, the King and Queen kneeling and the same reclining, are his. The kneeling King is one of the masterpieces of the French Renaissance. One of the most charming of the works attributed to Pilon is the mantel now in the Louvre which formerly stood in the château of Villeroy. Other fine works in the Louvre are the bronze statue of Cardinal René de Birague, one of the glories of

French sculpture; four wooden figures of the "Cardinal Virtues"; a terra-cotta "Virgin of Pity"; a nude reclining figure in painted stone; and the busts of Charles IX and Henry III. A marble head of Charles IX is in the Metropolitan Museum, New York (Altman collection). Pilon was also charged with the construction of the chapel of the Valois, at Saint-Denis, now destroyed. To the sculptures of this chapel belonged the reclining statues of Henry II and Catharine de' Medici at Saint-Denis and several statues now dispersed in insignificant churches in Paris, notably one of St. Francis of Assisi. In 1571 he had lodgings in the Hôtel de Nesle and assisted in arranging the triumphal entry of Charles IX into Paris. In 1573 he was appointed comptroller general of the coinage. It is supposed that he made the great bronze medals of the Valois, the most interesting of which are those of Catharine de' Medici and Henry III. Pilon died Feb. 4, 1590. His reputation as a sculptor of the High Renaissance in France is second only to that of Goujon. Consult Louis Goussier, *La sculpture française* (Paris, 1895), and Stanislas Lami, *Dictionnaire des sculpteurs de l'école française, du moyen âge au règne de Louis XIV* (ib., 1898).

PILOT (OF. *pilote*, Fr. *pilote*, probably from OF. *piloter*, *pilotier*, to sound with plummet and line; probably connected with Dutch *peillood*, sounding lead, from *peilen*, MDutch *peylen*, *piflen*, from MDutch *pegelen*, to gauge, from *pegel*, capacity of a ship's gauge + *lood*, MDutch *loot*, Goth. *lôþ*, Ger. *Lot*, AS. *lead*, Eng. *lead*). A person who makes a business of conducting vessels in and out of port, through narrow channels, up rivers, or along coasts where the navigation is specially difficult or dangerous. He is possessed, or is supposed to be possessed, of sufficient knowledge of all reefs, rocks, shoals, currents, and other dangers to navigation in the region for which he professes to be, or is licensed as, a competent pilot. Except in little-frequented ports pilots are usually members of a pilot association or company organized under authority of law; and they are required to pass examination as to fitness before being appointed or licensed. The pilotage fees are not retained by the pilot in each case, but are paid into a common fund which is divided among the members according to the rules of the association. In order to furnish a sufficient fund for the payment of an adequate supply of pilots, pilotage is compulsory in many ports, but in these places vessels usually need pay only half pilotage if they do not actually take a pilot. In ports that are not very easy of entrance, marine insurance policies usually require that local pilots be employed under penalty of forfeiture of the policy. Masters of vessels frequenting particular ports very commonly take out a pilot license to reduce the expense of entry and departure. Pilots may be found off all large ports. They were formerly always carried in small fast-sailing schooners or similar vessels, but in recent years many pilot boats are steam vessels. Pilot boats carry numbers, which are placed on the sail or conspicuously painted on the hull (if a steamer). A century ago a pilot was a necessity for a ship entering a locality unfamiliar to the captain or master; but the great improvement in charts, the increase in the number of lighthouses, buoys, beacons, and other aids to navigation, and the change of motive power from sail to steam in more than half the large

vessels of the world have contributed to lessen the pilot's importance.

Pilot Fee. The sum of money paid to a pilot for his services in guiding a vessel in or out of a harbor is called pilotage. Where a pilot is engaged by the proper officer of a vessel, the pilotage is a lien on the vessel. Consult E. C. Benedict, *American Admiralty: Its Jurisdiction and Practice* (4th ed., New York, 1910).

PILOT, THE. A sea tale by James Fenimore Cooper (1823) of the romantic career of Paul Jones.

PILOT CHART. The Pilot Charts of the North Atlantic and of the North Pacific Oceans, issued monthly from the United States Hydrographic Office, Navy Department, Washington, give, in a form suitable for use by seamen, a general view of the climatological conditions prevailing over each of these oceans during the successive months of the year, with certain deductions therefrom, along with a large amount of additional information, meteorological and other, which is likely to prove of value to navigation. The charts are drawn on the Mercator projection, that of the North Atlantic extending from the equator to 60° north and from the meridian of 10° east to 102° west, that of the North Pacific from the equator to 70° north and from 75° west to 117° east. Each of the charts is published some days prior to the first day of the month to which it refers. They are lithographed in three colors, black, blue, and red, the color serving, within certain limits, as an index to the character of the information conveyed. The base of the chart, along with such information as is invariable throughout the year, is printed in black. Among other matter this embraces the lines of equal magnetic variation (see COMPASS, TERRESTRIAL MAGNETISM) for the current year, than which no feature of the chart is more highly appreciated by navigators, owing to the almost universal employment of the Pilot Chart as a track chart, on which the position of the vessel from day to day is plotted. See SAILING.

For the purpose of climatological study the surface of the ocean is supposed to be divided into rectangular areas by the even five-degree parallels of latitude and meridians of longitude, 5°, 10°, 15°, etc. The Pilot Chart for any month gives in blue for each of these areas the atmospheric pressure and temperature prevailing under normal conditions, the average force of the wind, the number of hours within the month during which the wind may be expected to blow from a given quarter, and a mention of the frequency of calms, derived from a discussion of the observations taken within the same month during previous years. All of this is shown symbolically on the face of the chart. In addition to this a brief text, containing a forecast or statement of the average conditions that may be expected during the month for the more frequented parts of the ocean, the probability of storms, the nature of these storms, the frequency of fog (upon the Pilot Chart of the North Atlantic Ocean this is also shown graphically upon the face of the chart), and the limits within which dangerous masses of floating ice may be expected, is also given in blue. The proper sailing and steamship routes for the given month and the limits of the trade winds are exhibited also.

The information given in red is in the nature of a review. Upon the Pilot Chart of the North

Atlantic Ocean it comprises a brief account of the main features of the weather over that ocean during the month preceding the date of publication of the chart. The path followed by the centre of each of the more important barometric depressions that have occurred within that period is shown, and the force of the winds that accompanied them, the latter on the Beaufort scale. The region through which fog has been frequent is shown also. Upon the Pilot Chart of the North Pacific Ocean appears the average track followed by the centres of the barometric depressions for the month that occurred during the 10-year period 1878-1887; also the tracks followed by the centres of the various classes of typhoons, those terrific storms which render navigation in eastern Asiatic waters so often fraught with danger. Upon both charts is given in red the last reported position of floating derelicts, wreckage, buoys, and other obstacles to navigation. Recently reported icebergs and field ice are shown also, all of these being plotted on the chart precisely where last sighted, in order that the mariner may have the dangers that menace his vessel constantly in view, without dependence on his memory and without reference to any publication save the chart before him.

Other features of the chart are the list of equator crossings for several future months, intended for the use of vessels bound on distant voyages; the list of new charts recently published and of additions and corrections to old charts; the storm warnings displayed by the United States Weather Bureau and by other maritime nations, all of which are shown graphically. In addition to these the land space of the chart is always devoted to a discussion of some topic of interest to navigators, such as studies in the law of storms, the experience of various vessels in recent cyclones, recent improvements in the theory and practice of navigation, the relative advantages of different sailing routes, and other similar subjects. The reverse of the chart is also frequently utilized for this purpose, one of the interesting publications of the United States Hydrographic Office being the chart which appears annually on the back of the Pilot Chart, showing the drift of sealed bottles which are cast overboard in various parts of the ocean and which find their way to distant shores.

As in the days of Maury, so now the United States government is still the pioneer in this class of publications for the benefit of seamen. The first edition of the Pilot Chart of the North Atlantic Ocean appeared in December, 1883, that of the North Pacific Ocean in January, 1894. The German government and also the English have entered the field, each of these having in January, 1901, begun the publication of a chart of the North Atlantic embodying many of the features of the American Pilot Chart. The German chart bears the title *Nordatlantische Wetterausschau*, and is published monthly by the Deutsche Seewarte, Hamburg. The British Pilot Chart extends also over the Mediterranean Sea, and is published monthly by the Meteorological Office in London. See HYDROGRAPHIC OFFICE.

PILOT FISH, or **ROMERO**. A fish (*Naucratus duotor*) of the family Crangidae, resembling the mackerel, except that there are no finlets succeeding the dorsal fin. It gets to be about 2 feet long; the general color is silvery grayish blue, five dark transverse bands passing around

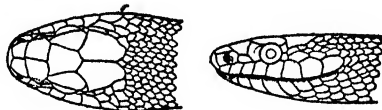
the whole body. Its flesh is said to be very delicate, resembling mackerel in flavor, but it is not often found in the markets. It is the only species of the genus, and is widely distributed through the tropical seas. It is often seen in the company of a shark, and is therefore very commonly supposed to direct the shark to its prey. The probable fact is that the pilot fish, in company with sharks and other fishes, follow in the wake of vessels for the purpose of picking up anything edible that may fall from the ship. It is not impossible that the pilot fish finds it a decided protection against enemies to be associated with the shark and in this way has developed the habit. A related fish, one of the amber fishes, is often called shark's pilot; it is *Seriola zonata*, of the American coast from Cape Cod to Cape Hatteras; and a West Indian demoiselle (family Pomacentridæ, *Eupomacentrus leucostictus*) is called black pilot, or cock-eye pilot. The name "pilot fish" is given also to the round whitefish (*Coregonus quadrilateralis*) of the Great Lakes.

Consult George Bennett, *Gatherings of a Naturalist in Australia* (London, 1860), and G. B. Goode, *Fishery Industries* (Washington, 1884). See WHITEFISH; and Plate of HORSE MACKEREL.

PILOT KNOB. A conical hill in Iron Co., Mo., 75 miles southwest of St. Louis (Map: Missouri, F 4). It is about a mile in diameter at its base and consists of beds of iron ore, porphyry, and porphyry conglomerates. The ore is hard, specular, steel gray in color, extremely brittle, and with a faint lustre. A few miles to the northwest is Iron Mountain (q.v.).

PILOT MOUNTAIN. A mountain in North Carolina. See ARARAT.

PILOT SNAKE. 1. A North American black snake which is black or brown above, with or without darker spots approximately square; the belly is very darkly clouded and the head not banded. It is common from New Jersey to Texas, especially in the Middle States, where it is often called mountain black snake, but is known to the mountaineers of the Alleghanian ranges as pilot snake. It is a denizen of forests to a great extent, hiding in hollow logs and in holes of old trees. It climbs trees easily, and in the spring feeds largely upon birds and their eggs and fledglings; otherwise its prey is mainly mice, rabbits, and other small animals. It is



PILOT SNAKE (*Coluber obsoletus*).
1, top of head; 2, profile.

not only entirely harmless, but is remarkable for gentleness, making little resistance to being handled, and soon becoming tame. Stejneger says this species deposits its eggs in hollow stumps and similar places, where they hatch in early summer. Consult Cope, *Crocodylians, Lizards, and Snakes* (Washington, 1900).

2. A local name in the Eastern States for the copperhead (q.v.) and for the fox snake (q.v.).

PILOTY, pé-lô'té, KARL VON (1826-86). A celebrated German historical painter. He was born at Munich, Oct. 1, 1826, the son of the lithographer Ferdinand Piloty (1786-1844), and

was first instructed by his father. Entering the Academy at the age of 12, he studied under Schnorr von Karolsfeld, at the same time assisting his father, whose lithographic business he managed after the death of the latter. He studied also in Antwerp and Paris (1852), becoming thoroughly imbued with the spirit of the Belgian and the French colorists, as is shown by his "Young Mother Dying" (1849) and "The Nurse" (1853). The latter, which was particularly commended for brilliant technic and realistic conception, foreboded a new era. It brought him the commission to paint for the Maximilianeum "The Founding of the Catholic League in 1609" (1854), and the "Sani before the Body of Wallenstein" (1855, New Pinakothek, Munich) led to his appointment as professor at the Academy in 1856. His remarkable ability as a teacher soon made the school of Munich the foremost in Germany. On a visit to Italy in 1858 he made the studies for his "Nero on the Ruins of Rome" (1861, National Museum, Budapest). His principal works during the next decade include "Galileo in Prison" (1861, Cologne Museum); "Godfrey of Bouillon and the Crusaders Approaching the Holy Sepulchre" (1862, Maximilianeum, Munich); the "Death of Caesar" (1865, Hanover Museum), his best-composed work; and "Columbus Discovering America" (1866). Called to Berlin in 1869, he was induced by the personal appeal of King Louis II to remain in Munich, and received the commission to paint "The Triumph of Germanicus" (1873, New Pinakothek), a replica of which is in the Metropolitan Museum, New York.

On the death of Kaulbach in 1874 Piloty was appointed director of the Academy, and soon after his appointment he began the huge allegorical painting of "Monachia" (completed 1879) for the new City Hall. Conspicuous as his only biblical subject appears the parable of "The Wise and the Foolish Virgins" (1881, Metropolitan Museum, New York). His last works were "Under the Arena" (1883), "The Council of Three in Venice" (1885), and "The Death of Alexander the Great" (1886, National Gallery, Berlin), which he left unfinished. Measured by present-day standards, Piloty's work seems deficient in almost all technical qualities, even in its famed color. Its reputed realism now seems mere theatrical pathos. Nevertheless it ranked high in its day and was epoch-making in the development of German painting. Through it the color element, which had been forgotten in the cartoon (q.v.) style that had prevailed since Cornelius (q.v.), was restored to Munich and to German painting.

His brother FERDINAND (1828-95), born in Munich, studied under Schorn at the Academy and worked subsequently under Karl's influence. His name is favorably known through historical frescoes in the National Museum, Munich, the town hall at Landsberg, and the castles of King Louis II. Among his oil paintings may be mentioned "Queen Elizabeth Reviewing her Army in Sight of the Armada" (Maximilianeum) and "Sir Thomas More in Prison" (Wiesbaden Gallery). He also deserves notice as an illustrator for the Schiller and Shakespeare galleries. Consult: K. A. Regnet, in *Münchener Künstlerbilder*, vol. ii (Leipzig, 1871); Ferdinand Pecht, in *Deutsche Künstler des 19. Jahrhunderts*, vol. iii (Nördlingen, 1881); *Modern Artists*, published by F. G. Dumas (Paris, 1882); Richard Muther, in *Allgemeine deutsche Biographie*, vol.

xxvi (Leipzig, 1888); F. Rosenberg, in *Geschichte der modernen Kunst*, vol. iii (ib., 1889).

PILPAI, pil'pi. See BIDPAI.

PILSBRY, pilz'bri, HENRY AUGUSTUS (1862-). An American conchologist, born in Iowa City, Iowa. He was a student at the University of Iowa, from which, in 1899, he received an honorary Sc.D. He devoted himself especially to the study of the mollusks, and after 1888 was special curator in the Department of Mollusks in the Philadelphia Academy of Natural Sciences. Beside numerous papers in scientific journals he published a *Manual of Conchology* (26 vols., 1888-1911); *Marine Mollusks of Japan* (1895); *Barnacles of the United States* (1907).

PILSEN, pil'zen (Boh. *Plezeň*). The second largest city of the Austrian Crownland of Bohemia, situated in a fertile valley at the confluence of the Mies and the Radbusa, 68 miles southwest of Prague (Map: Austria, C 2). It is well laid out and has many fine structures, among which are the Gothic St. Bartholomew's Church (1292), with the highest spire in Bohemia, 335 feet; a town hall in Renaissance style, built in 1558, containing the banquet hall in which Wallenstein (q.v.) received the oath of fidelity from his generals; a number of museums; various schools and Gymnasias; and a municipal brewery. The brewery occupies a complete district of the town, the cellars alone being 4 miles long. Pilsener beer is famous all over the world. Besides its breweries Pilsen has wire works, ordnance works, bell foundries, paper mills, refineries, glass-blowing establishments, copper works, potteries, etc. The city is governed by a burgo-master and a council of 36 members. Pop., 1910, 81,165, mostly Czechs.

In its early days the city was fortified and during the Hussite wars it suffered severely. In 1634, 24 followers of Wallenstein were hung in the market place. The first printing press in Bohemia was set up in Pilsen (1468).

PILT'DOWN SKULL. See MAN, SCIENCE OF, ANCIENT TYPES.

PILUM. See JAVELIN.

PILZ, pilts, VINCENZ (1816-96). An Austrian sculptor, born at Warnsdorf, Bohemia. He studied at the Vienna Academy, at first painting, then sculpture under Kähssmann and Bauer, and in Rome (1849-55) was the pupil of Tenerani and Cornelius. After his return to Vienna he was influenced by Führich and afterward by Rahl, under whose direction he produced numerous reliefs, statues, and groups. These include "Science and Commerce," for Windsor Castle; the two "Winged Horses" in front of Memorial Hall at Philadelphia; and in Vienna the "Nephtune Group" at the Exchange, 6 statues of antique celebrities for the Museum, 10 of composers for the Conservatory, and several of generals for the Arsenal, besides many others for various public buildings.

PIMA, pē'mā. One of the leading tribes of the Piman stock (q.v.). Before being collected upon Gila River and Salt River reservations, Arizona, where they now reside, they roamed, jointly with the Papago, who are virtually the same people, over all the territory from the middle Gila southward to Sonora, Mexico. According to their own traditions, which seem to be confirmed by archeological evidence, they formerly lived farther to the northeast, in the Salado River valley, where they had permanent pueblo towns and irrigating canals. Being driven out by hostile tribes, they gradually

moved down the Gila valley, halting on their way long enough to build and occupy the noted Casa Grande ruins. In their new homes on the Gila they ceased to build substantial structures and contented themselves with dome-shaped huts of poles covered with thatch and earth. They retained their agricultural habit, fertilizing their fields by means of extensive irrigation canals, and cultivating corn, beans, pumpkins, melons, and cotton, men and women working together. They also prepare a sort of bread from the mesquite bean and a liquor from the great Zaguara cactus. The women make pottery and weave beautiful water-tight baskets. (See Colored Plate of INDIAN BASKETS, under BASKET.) They were brought under the influence of Spanish missionaries at an early period, but revolted under their chief, Don Luis, in 1751, destroying all the missions, with every other Spanish settlement in their country. They were subdued after about two years of fighting and have since remained at peace with the whites, although until recently they were obliged continually to defend themselves against the raiding Apache. They bear a high reputation for courage, industry, and honesty. They number 4236. For about a century the weaker Maricopa (q.v.) have been associated with them. Consult Frank Russell, "The Pima," in *Bureau of American Ethnology, Twenty-sixth Annual Report* (Washington, 1908). See PIMAN STOCK.

PIMAN (pé'man) **STOCK**. An important group of cognate tribes occupying nearly the whole of the west coast and Sierra Madre region of Mexico and Arizona from the Gila River southward into Jalisco, and including, besides other tribes and subtribes, the Huichol, Mayo, Opata, Papago, Pima, Tarumari, Tepehuan, and Yaqui. As a rule they are sedentary and agricultural, nearly in the culture state of the Pueblo tribes, but perhaps not quite so far advanced in house building. Owing to the nature of their country, which makes intercommunication generally difficult, their systems of government are usually communal rather than tribal. Although as a body not aggressive, some of their tribes, notably the Yaqui and Tepehuan, have maintained a determined resistance to the Spanish and the Mexicans. The whole number may be about 120,000, of whom the Tarumari make perhaps one-half. Consult Frank Russell, "The Pima," in *Bureau of American Ethnology, Twenty-sixth Annual Report* (Washington, 1908).

PIMENTO, PIMIENTO. See ALLSPICE; PEPPER.

PIMLICO, pim'li-kō. See FRIAR BIRD.

PIMPERNEL (OF., Fr. *pimpernelle*, from ML. *pimpernella*, *pimpnella*, *pipennella*, *pinipennella*, with the original initial *p* assimilated to the following, *bipennella*, *bimpennella*, *bibanella*, *pimpernel*, from Lat. *bipennis*, two-winged, from *bi*, two + *penna*, *pinna*, wing), *Anagallis*. A genus of annual and perennial plants of the family Primulaceæ, natives chiefly of temperate climates, with beautiful but small flowers. Several species are cultivated in flower gardens; others are weeds. Among the best known are the scarlet pimpernel (*Anagallis arvensis*), introduced into the United States and also known as poor man's weatherglass, from the quick closing of the flowers at the approach of a storm; the blue pimpernel (*Anagallis cœrulea*), a form of the preceding; and the bog pimpernel (*Anagallis tenella*). These are all European species. The water pimpernel (*Samolus valerandi*), also

called brookweed, is a plant of the same order and of almost world-wide distribution, growing in watery, gravelly places. It has racemes of small white flowers.

PIN (AS. *pinn*, from ML. *pinna*, pin, nail, peak, Lat. *pinna*, *penna*, feather, wing, fin, pen). Probably the pin in its most primitive form of a spike, thorn, or fish bone was employed long before the earliest needle and thread as a means of fastening a garment together. (See NEEDLE.) Among the remains of the lake dwellers of central Europe have been found a great number of pins—some of bone, others of bronze. Many of these are quite elaborate, with ornamental heads, while others are rudely fashioned. Some have double stems, and a few have been found in form exactly like the modern safety pin. Examples of artistically wrought pins are found among Egyptian as well as Greek remains. Ancient Roman bronze pins and bone hairpins, with ornamental heads, have been found at Pompeii. The Romans also made very elaborate fibulæ, the prototype of the modern brooch. As a requisite of the toilet pins of iron wire were made in England during the fifteenth century; brass wire pins were introduced from France in 1540 by Catharine Howard, Queen of Henry VIII. The invention of the process of drawing wire was the foundation of modern pin manufacture, and for years the industry was confined to the two countries, France and Germany, where this process was invented. Brass wire pins were first made in England in 1826. The industry spread rapidly, so that within 10 years it was well established at Gloucestershire, Bristol, Birmingham, and London, and the pin makers of the last-named city had formed a corporation.

At first pins were made by filing a proper length of wire to a point and then twisting a piece of fine wire around the other extremity. The complete process involved 13 or 14 operations, requiring the labor of as many different persons. Naturally most of these processes were performed by hand tools as distinguished from modern automatic machinery, and in many cases a whole pin was made at a time, and it may be said in passing that in 1775 the American Congress offered a premium of £50 for the first 25 dozen domestic pins equal to those imported from England. In 1797 a solid-headed pin was made by Timothy Harris, of England. The blanks were placed in a two-part mold in which prints at the proper place represented the pin head. Into this mold an alloy of lead and antimony was poured, which solidified and formed a solid head to the pin. The most important improvement was the machine invented by Lemuel Wellman Wright, of the United States, in 1824. This made solid heads to the pins by a process in principle like that used for nail making, viz., by driving a portion of the pin itself into a countersunk hole. The action, however, was automatic and consisted in an arrangement by which the wire was seized in two small grooved cheeks. When both cheeks are placed face to face, the wire is held tightly in the groove with a small portion projecting, a small ram or hammer connected with the machine strikes on the projecting portion described, and compresses it into a small cupshaped depression, and thus the head is formed. In 1831 a machine for making perfect solid-headed pins was invented by John Ireland Howe, a physician in Bellevue Hospital, New York City. The following year a company was organized to make

pins after his patents, which, six years later, moved to Derby, Conn. Samuel Slocum, referred to below, began the making of pins in the United States in 1838, using a machine he had invented but not patented in America.

The modern automatic pin-making machine completes the pin in all respects except the coloring and polishing. The pin is formed from wire—iron for the cheapest pins, hardened crucible steel for the best, and brass for the great majority. A reel of wire as it comes from the wire drawer is placed in the rear of the machine, and the end of the wire is taken hold of by a pair of nippers, which pull it over a straightening board and pass it on completely straightened until it is seized by two cheeks, when a cutter descends and cuts it off, leaving the projecting part for the head; on the withdrawal of the cutter the hammer flies forward and makes the head as before described; the cheeks open, and the pins drop upon a sloping metal plate, finely grooved, down which they slip with the heads upward, until the end which is to be pointed comes in contact with a cylindrical roller with a grinding surface, which soon grinds points upon them by the operation of two or three ingenious arrangements; the first is that the grooved surface of the plate by which the pins descend terminates a little above the grinding roller, then a slight depression is given to the sloping plate and also to the roller, so that one end is an inch or two lower than the other; therefore, as the pin descends the groove and is thus brought down the inclined plate until it lies on the smooth part, where it is highest, and its end in contact with the grinding roller which is revolving, the pin itself is compelled to turn round by the friction of the roller and gradually descends from the upper to the lower part of the inclined plate and then falls into a box placed to receive it. These operations are performed so rapidly that they can scarcely be perceived by the eye, and the pins, beautifully pointed, fall into the box in a stream at a rate of from 200 to 400 a minute. They are then washed in hot water and potash or soda or tumbled in sawdust, washed again, tinned, and prepared for papering.

Samuel Slocum, of Connecticut, invented the first pin-sticking machine. It was introduced into Dr. Howe's factory in 1841. The modern sticking machine is worked by two operatives; one feeds the machine with pins, the other with papers. The first part of the machine is a box, about 12 inches long by 6 inches broad and 4 inches deep; the bottom is made of small square steel bars, sufficiently wide apart to let the shank of the pin fall through but not the head, and they are just as thick as the space between the papered pins. The lower part of the bottom of the box is made to detach itself as soon as the row of pins is complete, and row after row at regular intervals is received and passed down a corresponding set of grooves, until they reach the paper, which, as before described, is pinched into regular folds and pierced to receive the pins, which come exactly to their places and are pressed into them.

The same general process is followed in the making of safety pins, only here the process is more complex, since not only must the wire be cut and pointed, but it must be bent to the desired shape, and in certain styles of pins a sheath or catch for the point must be attached. The machines are entirely automatic in their action and require but little attention.

Enamel-headed pins are largely made at Aix-la-Chapelle, Germany. Enamel, or glass, is spun into a rod about $\frac{1}{8}$ of an inch thick. The end of this glass is kept viscous by a gas jet. Into this soft substance the workman plunges the pin shank and by a complex whirling motion detaches a bulbous mass from the rod, which adheres as a head to the pin.

Black or mourning pins are made of iron wire, heated in a muffle till the proper tint is obtained; or they are coated with a suitable varnish, which is afterward hardened by storing the pins.

Statistics. The chief pin-manufacturing centres are located as follows: in France; at Aix-la-Chapelle, Germany; at Birmingham, England; and, in the United States, principally in Connecticut. In 1850 there were four pin factories in the United States, having a combined capital of \$164,800 and a combined annual product of \$297,550. In 1900, 50,167,817 gross of pins were produced, valued at \$898,054. Of these 47,338,429 gross were common or toilet pins; 1,189,104 gross were hairpins, 1,640,284 gross were safety pins. In the 1910 census of manufactures separate statistics were not compiled for pins, they being included with needles. Consult Longman and Loch, *Pins and Pin-cushions* (London, 1911)

PIÑA (pē'nyā) **CLOTH** (Sp., pineapple). A very beautiful fabric made of the fibres of the leaves of the pineapple plant (*Ananas sativa*) and other allied species (See BROMELIA.) It is of a delicate, soft, transparent texture and a yellowish tint. This cloth, which is made in the Philippines by the natives, resembles horsehair cloth, because the threads both of warp and weft are each single unspun fibres, consequently only small pieces can be made; the workers have, however, a plan of joining the fibres of the coarser kinds end to end, so as to make warp threads of considerable length. Piña cloth is very strong, and the better sorts far excel the finest lawns in texture.

PINACATE (pin'ā-kā'tā) **BUG**. Any of the tenebrionid beetles of the genus *Eleodes*, especially common in the western United States. They are large, smooth, clumsy, wingless black beetles, which congregate in large numbers under stones and pieces of wood. They defend themselves when disturbed by elevating the hinder portion of the body and discharging an oily fluid.

PINACEÆ. One of the two families of conifers, according to current classification. They are distinguished in general from the other family (Taxaceæ) by the distinct cones and the dry seeds. See PINE.

PIN'AFORE, H.M.S. A comic opera, words by Sir William S. Gilbert and music by Sir Arthur Sullivan (qq.v.), first produced in London, May 25, 1878; in the United States, Jan. 15, 1879 (New York).

PIN'AKOTHEK' (Ger., from Gk. *πινακothήκη*, *pinakothēkē*, picture gallery, from *πίναξ*, *pinax*, picture, *θήκη*, *thēkē*, receptacle). Among the Hellenes, a term used to designate a room or building near a temple, for the preservation of pictures brought as votive offerings to the gods. The Romans applied it to the entrance to the atrium of a house, which often contained statues, pictures, and other objects of art. Pinacoteca is the usual Italian term for a gallery of paintings; but the most celebrated collection bearing this name is the Old Pinakothek in Munich, erected in 1826-36, after designs by Klenze, the

architect of the Glyptothek. The New Pinakothek was completed in 1853, and in it are placed the works of contemporary artists. The former is one of the most important in Europe. It owes its origin to the collection of the Bavarian rulers, begun in the sixteenth century, to which were added in 1805 the pictures of the Düsseldorf Gallery, rich in Netherlandish paintings, and the Boisseree collection of German primitives. The Old Pinakothek is especially rich in early German paintings, among which are the most important group of Dürers (14) in any collection, including his own portrait and the "Four Apostles." The Flemish and Dutch schools also are well represented. The collection of Rubenses, numbering over 80 examples, is the largest and most important in the world. There are 36 Van Dycks, 22 Rembrandts, 18 Brouwers, good examples of Terboch, Pieter de Hoghe, Steen, and of both Ruysdaels. Among the important Italian pictures are three Raphaels and eight Titians. One of the corridors of the building is divided into 25 alcoves frescoed by Cornelius, with works illustrative of the history of the fine arts in the Middle Ages. The lower story of the building contains 9000 drawings by the old masters, and a cabinet of more than 300,000 engravings. Consult the official catalogue and publications of the gallery; and for reproductions, the publications edited by Karl Voll (Munich, 1905) and Franz von Reber (Leipzig, 1908).

PINANG'. See BETEL.

PINAR DEL RÍO, pé-när' dél ré'ó. A province of Cuba, occupying the west end of the island (Map: Cuba, B 4). Its area is 5000 square miles. The Cordillera de los Organos, reaching a height of 2500 feet, runs lengthwise through the province, and the land slopes gradually to the coasts on either side, which, especially in the southwest, are low and marshy. The south slope is the celebrated Vuelta Abajo, where the finest tobacco in the world is grown. Tobacco is the main product. Sugar cane, coffee, and fruits, and in the lowlands sea-island cotton, are also grown, and there are extensive lumbering and some cattle raising and copper mining. Pop., 1914, 257,893. The capital is Pinar del Río.

PINAR DEL RÍO. The capital of the province of the same name in Cuba. It is situated on the south slope of the mountains, 90 miles southwest of Havana, with which it is connected by rail (Map: Cuba, B 4). The principal buildings are the Governor's palace, the institute, and the armory. It is the centre of the tobacco industry of the Vuelta Abajo, and a good road connects it with the port of Coloma. Pop., 1899, 8880; 1907, 10,634.

PINARIA GENS. An ancient patrician clan at Rome, who, with the Potitii, were believed to have entertained Hercules when that hero, having killed Geryon (q.v.), came to Italy and there fought with Cacus (q.v.; see also HERCULES). Another story declared that the Potitii perished because, instead of performing the rites themselves, they handed them over to slaves of the state. Consult Livy, i, 7; Dionysius of Halicarnassus, *Antiquitates*, i, 40; Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

PINASTER. A kind of pine (q.v.).

PIN BORER, or SHOT BORER. Any of several of the bark-boring beetles (family Scolytidae), which in issuing from their food plants

leave holes through the outer bark that are usually very small. See AMBROSIA BEETLES; BARK BEETLE.

PINCH (from OF., Fr. *pincer*, to pinch, of unknown origin). A term used in connection with mineral deposits to indicate a marked narrowing of the vein or bed. Pinches may be caused by movements in the rocks or by irregularities of deposition.

PINCHBACK, PINCKNEY BENTON STEWART (1837-). An American lawyer and politician of African descent, born at Macon, Ga. He was educated in the public schools in Cincinnati, Ohio, commanded colored troops in the Federal army during the Civil War, and was a Louisiana State Senator in 1868-71. He was lieutenant governor of Louisiana in 1871-72 and acting Governor in 1872 and was elected to Congress in the latter year. Early in 1873 he was named United States Senator for Louisiana, but the seat was contested and decided against him. In the same year he served as commissioner to the Vienna exhibition from Louisiana, was made a member of the Board of Education of that State in 1877, and served as a trustee of the Southern University in 1883 and 1885. He studied law at Straight University and was admitted to the bar in 1886.

PINCHBECK (named from its inventor, Christopher Pinchbeck, a London clockmaker of the eighteenth century). An alloy of copper and zinc, usually in the proportion of nine parts of the former to one part of the latter. It has a color resembling red gold and was formerly largely used in making watchcases and similar articles in imitation of gold, but has given place entirely to the so-called gold-filled ware.

PINCHE MARMOSET. See Plate of MONKEYS, AMERICAN.

PINCHE'S, THEOPHILUS GOLDBRIDGE (1856-). An English Assyriologist. He was born in London, learned his father's trade of die sinking, but at 19 began to study Assyrian. In 1900, after 22 years of service, he retired from the British Museum, where he had been employed in the department of Egyptian and Assyrian antiquities. He had an important part in the publication of the *Cuneiform Inscriptions of Western Asia* and the *Cuneiform Texts from Babylonian Tablets*, both issued by the British Museum, and wrote many articles in Hastings's *Dictionary of the Bible*. He published, besides, *The Old Testament in the Light of the Historical Records and Legends of Assyria and Babylonia* (1902; 3d ed., 1908); *The Bronze Ornaments of the Palace Gates of Balawat* (1902); *The Religion of Babylonia and Assyria* (1906); *The Amherst Tablets* (1908); *An Outline of Assyrian Grammar* (1910).

PINCHOT, pin'shō, AMOS RICHARDS ENO (1873-). An American lawyer, social reformer, and political leader. A brother of Gifford Pinchot, he was born in Paris, France, where his parents were visiting. He graduated from Yale in 1897 and studied law at Columbia and at the New York Law School. During the Spanish-American War he served with the First Volunteer New York Cavalry in Porto Rico. In 1900-01 he was deputy assistant attorney for New York. Interested in social service and sociology, he wrote numerous articles on the conditions of the poor and on industrial organization. In the organization of the Progressive party he was one of Roosevelt's prominent supporters. In 1914, however, Pinchot began to criticize severely G. W. Perkins, chairman of the

executive committee of the party, because of his connection with the trusts, and within a year he had identified himself with the Republicans. He helped to found the Pinchot School of Forestry at Yale and became a trustee of the People's Institute.

PINCHOT, GIFFORD (1865–). An American forestry expert and political leader, born at Simsbury, Conn. He attended Phillips Exeter Academy, graduated from Yale in 1889, and studied forestry in England, France (at the Nancy Ecole Nationale Forestière), Germany, and Switzerland. Upon his return to the United States Pinchot undertook, on the estates of George W. Vanderbilt (q.v.) at Biltmore, N. C., the first systematic forest work ever done in America. His work received such wide attention that he decided in 1893 to establish himself in New York as a consulting forester. Appointed in 1896 secretary of the forest commission of the National Academy of Sciences, he reported in the next year that wastefulness of forest resources was prevalent throughout the country. In 1897 Pinchot became an agent of the Department of the Interior and in 1898 Chief of Forestry. In 1901 he was made head of the Bureau of Forestry, a branch of the service which in 1905 was transferred by Act of Congress to the Department of Agriculture; in this capacity he served until 1910. For his important service in connection with conservation, see the article on that subject. During the same period he served on commissions concerned with public lands, government scientific work, administrative efficiency, inland waterways, and country life. In 1909 it was charged by Pinchot and some of his assistants that the Interior Department had facilitated the granting of claims to Alaskan coal lands when the claims were of doubtful legality, and, secondly, that the Secretary of the Department, Richard A. Ballinger (q.v.), had reversed the Roosevelt-Garfield policy of withdrawing the valuable water-power sites. Ballinger had also declined to allow Pinchot control of the forests on the Indian reservations. When President Taft upheld Ballinger, some of Pinchot's assistants appealed to the press, and Pinchot himself wrote a letter to Senator Dolliver to be read in the Senate. In it he reflected upon the good faith of the administration. In January, 1910, Pinchot was dismissed by the President for insubordination. The entire matter was made the subject of inquiry by a joint committee of Congress, the majority of which exonerated Ballinger. Public opinion was largely on the side of Pinchot. The controversy went far to sharpen the division between the progressive and conservative factions of the Republican party and to alienate Taft and Roosevelt, Pinchot's champion. In 1910 Pinchot was elected president of the National Conservation Association. In 1912 he was an energetic supporter of Roosevelt in the formation of the Progressive party; in 1914 he was the candidate of that party for United States Senator from Pennsylvania, but failed of election. Together with his mother and brother, Amos Pinchot (q.v.), he founded the Pinchot School of Forestry at Yale. Gifford Pinchot attempted to do relief work in Belgium in 1915, but was expelled by the German authorities because his sister was the wife of Sir Alan Johnstone, British Minister at The Hague. His writings include: *The White Pine* (1896); *A Study of Forest Fires and Wood Production in Southern*

New Jersey (1897); *The Timber Trees and Forests of North Carolina* (1897); *The Adirondack Spruce* (1898); *Primer of Forestry* (1899); *The Fight for Conservation* (1909); *The Country Church* (1913). See CONSERVATION.

PINCIAN (pín'shi-an) **HILL**, or **MONTE PINCIO**, món'tà pin'chò. A hill at Rome, 164 feet in height, forming a spur of the Quirinal (q.v.), from which it is separated by a small valley. It was not included among the famous seven hills of Rome or regarded as a part of the earlier city. It was famous as the site of magnificent gardens, including those of Acilius Glabrio, of the Anicii, where the Villa Medici now stands, and of Lucullus (see LUCULLUS, GARDENS OF), and therefore bore the name of Collis Hortorum. It is now the fashionable promenade of Rome and commands fine views of the city and the surrounding country. Consult K. Baedeker, *Central Italy and Rome* (15th Eng. ed., Leipzig, 1909), and S. B. Platner, *The Topography and Monuments of Ancient Rome* (2d ed., Boston, 1911).

PINCKNEY, CHARLES (1758–1824). An American statesman, born at Charleston, S. C. He studied law and was chosen to the Provincial Legislature before he was 21 years old. He was a member of the South Carolina Provincial Congress in 1785, and in 1787 he was a delegate to the National Constitutional Convention. He was Governor of South Carolina from 1789 to 1792 and in 1790 presided over the convention which framed the State constitution. From 1796 to 1798 he was again Governor and from 1798 to 1801 was a member of the United States Senate. From 1802 to 1805 he was Minister to Spain and secured a renunciation on the part of that country of her claims to the Louisiana territory. He was again Governor in 1806–08, was a member of the Legislature in 1810–12, and was a strong advocate of the War of 1812. From 1819 to 1821, in the National House of Representatives, he opposed the Missouri Compromise. He was a man of liberal ideas and favored the abolition of primogeniture in South Carolina, the removal of Jewish disabilities, and a system of free schools. He wrote a series of letters signed *Republican* (1800), which strongly advocated the election of Jefferson to the presidency.

PINCKNEY, CHARLES COTESWORTH (1746–1825). An American soldier and statesman, born at Charleston, S. C., son of Charles Pinckney, Chief Justice of South Carolina. He was educated in England, at Oxford and the Middle Temple. After studying for a time at the Royal Military Academy at Caen, France, he returned to America in 1769 and began the practice of the law at Charleston. He served in the first Provincial Congress of South Carolina in 1775, was elected captain of a provincial regiment in the same year, and became colonel in September, 1776. He was afterward one of Washington's aids-de-camp, participated in the battles of Brandywine and Germantown, and, returning to the South in 1778, joined the expedition to Florida. In 1783 he was promoted to be brigadier general, but, the war being over, he returned to his practice at Charleston. He was a distinguished member of the United States Constitutional Convention in 1787, of the State Convention which ratified the Federal Constitution, and of the convention which in 1790 framed a constitution for South Carolina. Sent to France in 1796 as United States Minister, his reception

was refused, and he was threatened with arrest by the Directory, which forced him to leave the country the year following; nor on his return to France as a joint commissioner with Elbridge Gerry and John Marshall was his reception more favorable. (See X. Y. Z. CORRESPONDENCE.) Talleyrand assured the commissioners that a gift of money was a necessary preliminary to the negotiations and that a refusal might bring on war. Pinckney is said to have answered: "War be it, then; millions for defense, sir, but not one cent for tribute!" On his return to the United States a war with France seemed imminent, and he was appointed a major general. He was the Federalist candidate for Vice President in 1800 and for President in 1804 and 1808 and was the third president general of the Society of the Cincinnati.

PINCKNEY, THOMAS (1750-1828). An American diplomat and soldier, born at Charleston, S. C. In 1753 he was sent to England with his brother, Charles Cotesworth Pinckney, to be educated, was admitted to the English bar in 1770, and returned to Charleston in 1772. Entering the Continental army as a lieutenant in 1775, he served as aid to Gen. Benjamin Lincoln, D'Estaing, and Gates successively, taking a conspicuous part in the battles of Stono Ferry (June 20, 1779) and of Camden (Aug. 16, 1780), at the latter of which he was wounded and taken prisoner, remaining in confinement until the close of the war. He was Governor of South Carolina in 1787-89, presided over the State Convention which ratified the Federal Constitution in 1788, was a member of the State Legislature in 1791, and served as Minister to England in 1792-94. In November, 1794, he was sent on a special mission to Spain, where he negotiated an important treaty (signed Oct. 27, 1795), guaranteeing to the United States the free navigation of the Mississippi, with privileges of deposit at New Orleans for at least three years, and setting the boundary of west Florida at the thirty-first degree of latitude, from the Mississippi to the Appalachicola. Returning in 1796, he was the Federalist candidate for Vice President in this year and was a Federalist member of Congress in 1799-1801. In the War of 1812 he served as major general in command of the Sixth Military District. Subsequently he retired from public life and spent his last years in Charleston. Consult C. C. Pinckney, *Life of General Thomas Pinckney* (Boston, 1895).

PINCKNEYA (Neo-Lat., named in honor of C. C. Pinckney), *GEORGIA BARK*, or *FEVER TREE*. A small tree, *Pinckneya pubens*, occasionally found in low or swampy land in Florida, Georgia, and South Carolina. It belongs to the family Rubiaceae, has large oval leaves and beautiful terminal clusters of purple-spotted flowers. The bark is used by the country people in intermittent fevers as a substitute for quinine.

PINCKNEYVILLE, pink'ni-vil. A city and the county seat of Perry Co., Ill., 62 miles southeast of St. Louis, Mo., on the Illinois Central and the Wabash, Chester, and Western railroads (Map: Illinois, F 9). Coal mining and flour milling are the chief industries, and there are timber interests. The water works are owned by the city. Pinckneyville adopted the commission form of government in 1915. Pop., 1900, 2357; 1910, 2722.

PINC-PINC, or **TINC-TINC**. See GRASS WARBLER.

PINDAR. See PEANUT.

PINDAR (Gk. Πίνδαρος, *Pindaros*). The most famous of Greek lyric poets. He was born near Thebes in Boeotia. A conservative in politics and religion, a singer of the athletic prowess of the old Æolian and Dorian nobility, he seems to belong to a more ancient order than that of the great Athenians of the fifth century B.C. Apart from the magnificence of his style, the chief points of interest in Pindar for us are that: (1) he was before the recovery of parts of Bacchylides (q.v.) from an Egyptian papyrus the only Greek lyric poet who could be studied in a considerable body of work; (2) he is the representative of a provincial, colonial, and in some ways larger Greece than that in which we are wont to see only a foil to Periclean Athens; (3) he is the first extant Greek writer to proclaim the immortality of the soul and to portray a future judgment; (4) he shows us the Greek myths in transition from their treatment by Hesiod, the older epic, and the lost lyrics of Stesichorus to the forms which they assumed upon the Attic stage.

Only the outline of his life is known. His earliest extant ode, the tenth Pythian, dates from about his twentieth year, before which time he is said to have studied under the best musical and poetic masters of Athens and Thebes and to have been the pupil or the rival of the Boeotian poetesses, Myrtis and Corinna. An early poem, overlaid with mythic ornament, is said to have called forth from Corinna the famous admonition: "One should sow with the hand and not with the whole sack." Pindar's family belonged to the noble clan of the Ægeids, which had widespread connections in Thera, Sparta, and Cyrene. His deep religious feeling caused him to cultivate intimate relations with the priesthood of the great shrines, especially that of Delphi, where his name was publicly honored for centuries. He seems to have traveled widely to all parts of the Greek world, from which his national reputation brought him commissions. At the court of Hiero (q.v.) in Syracuse he may have witnessed the famous eruption of Mount Etna, so magnificently described by him in his first Pythian ode and by Æschylus in the *Prometheus Bound*. He composed hymns or encomia for the priests of Ammon, for Alexander of Macedon, Arcesilaus of Cyrene, Theron of Agriguntum, Hiero of Syracuse, and for the noblest families of Thessaly, Rhodes, Corinth, Ægina, Athens, and Tenedos. No other Greek poet has so wide a geographical range. None presents so vivid a picture of the dazzling diversity of greater Hellas; none so adequately expresses the underlying spiritual unity preserved by the common language and religion and the tradition of the great Panhellenic temples and games. His Hellenic patriotism has been questioned because he says so little of Marathon and Salamis and so little in praise of Athens. As a citizen of a "Medizing" state, however, he could hardly have said more. Tradition has it that he said too much to please the Thebans, who fined him for the line cited from a lost dithyramb: "O splendid, violet-crowned, glorious Athens, famed in song, pillar of Hellas, city divine." The legend adds that the reward bestowed by the Athenians more than paid the fine.

Pindar and his contemporary Simonides (q.v.) represent the culmination of the Greek choral lyric composed with music to be sung by trained choruses of youths and maidens, as distinguished

from the personal lyric of a Sappho or an Alcæus, which was recited or half chanted to a slight accompaniment on the strings. Only fragments remain of Pindar's hymns to the gods, peans, dithyrambs, processional odes, dancing songs, dirges, and encomia. Of the *Pæans* considerable fragments were found by Grenfell and Hunt in 1906. (Consult the *Oxyrhynchus Papyri*, part v.) But we possess virtually entire the four books of his Epinician or triumphal hymns composed in honor of the victors at the four great national games—the Olympian, Pythian, Isthmian, and Nemean (See ISTHMUS; NEMEA; OLYMPIC GAMES; PYTHIAN GAMES.) The victor in the Olympic games received such honors as Rome and the modern world would bestow only upon the triumphant soldier. The victory was celebrated on the spot by festivities, usually impromptu, and later at the victor's home by triumphal processions, banquets, and serenades, often repeated for many anniversaries. If the victor was rich or had wealthy patrons, a Pindar, a Simonides, or a Bacchylides would be commissioned to write a special hymn to be sung during the procession or at the banquet by a trained chorus of his comrades. A large part of such a poem was conventionally predetermined. The poet's task was to ennoble the commonplaces by stately and melodious utterance, to transfigure the whole in the light of the splendor and magnificence of the Olympian or the Pythian festival. To this end Pindar employs the myth, which fills the central portion of the ode and often seems to have little connection with the immediate theme, but which closer study shows to be chosen with an art that we can sometimes only divine, either to express the dominant mood of the occasion or to connect the hero with the mythic past. The English reader may compare the treatment of the legend of the golden fleece in the fourth Pythian ode with the leisurely epic handling of the same theme in Morris's *Life and Death of Jason*.

It is customary to describe Pindar's sublimity by comparing him to the eagle or to the lonely Alpine peak. His style is untranslatable and indescribable. Horace compares it to a torrent that has burst its banks. (Consult *Odes*, iv, 2, 1-32.) Boileau, Cowley, Gray, and the long line of eighteenth-century authors of Pindaric odes thought to reproduce it by jerky, irregular rhythms, abrupt transitions, and bombastic diction. Matthew Arnold praises it as "the grand style in simplicity." Myers's beautiful translation into archaizing English prose reproduces the matter excellently, but hardly the manner. The best translation is that of Myers (London, 1899). Carey is the most readable of the older translators in verse. The chief editions are those of A. Böckh (4 vols., Leipzig, 1811-21), Fennell (2d ed., complete, New York, 1893-99), Bury (ib., 1890-92), Gildersleeve, *Olympian and Pythian Odes* (ib., 1885), and O. Schröder (1908). Comment and criticism will be found in Croiset's *Pindare* (2d ed., Paris, 1886); G. S. Farnell, *Greek Lyric Poetry* (London, 1891); Fracassoli, *Le odi di Pindaro* (Verona, 1894). in the "Introduction" to Gildersleeve's edition and numerous notes by Gildersleeve in various volumes of *The American Journal of Philology* (Baltimore); in R. C. Jebb, *The Growth and Influence of Classical Greek Poetry* (Boston, 1894); Gilbert Murray, *A History of Ancient Greek Literature* (New York, 1897); in *Journal*

of *Hellenic Studies*, vol. iii (London, 1882); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

PINDARIS. See PINDHAREES.

PINDEMONTE, pēn'dā-mōn'tā, IPPOLITO (1753-1828). An Italian poet, born at Verona of a noble Veronese family. He was educated at Modena, and in 1778 he went to Rome, where he was admitted into the Arcadia. Traveling much and living awhile in London he acquired familiarity with foreign and, particularly, English literature. The *Poesie Campestri* (1788) show clearly the influence of Gray and Young. His novel, *Abarotte*, a mixture of satire and autobiography, resembles Rasselas, while his tragedy, *Arminto* (1797-1804), imitates certain scenes of Shakespeare and has traces of the Ossian poems, perhaps also of Klopstock. His *Epistole* and *Sermoni* were written with the intention of imitating Horatian satire. His chief claim to consideration is the translation (1809-22) of the *Odyssey* into blank verse. He represents the influence of foreign literatures on the Italian during this period of transition and is a link between the idealistic literature of the eighteenth century and the romantic period of the Restoration. Consult the edition of his *Poesie originali* (Florence, 1858); the *Arminto* (in the 3d ed. of Verona, 1812); the *Odissea* (Florence, 1891); Montanari, *Storia della vita e delle opere di Ippolito Pindemonte* (Venice, 1856), S. Peri, *Ippolito Pindemonte*.

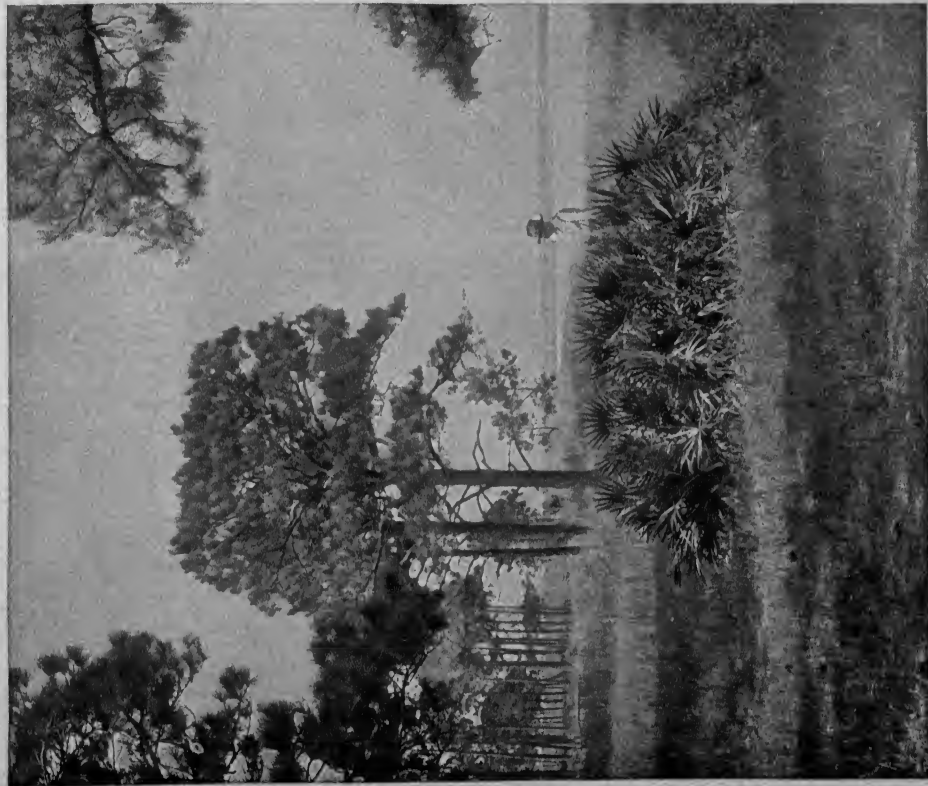
An elder brother of Ippolito was GIOVANNI PINDEMONTE (1751-1812), also a poet of some merit, whose *Baccanali* and *Coloni di Canda* are tragedies in the manner of Alfieri, but whose later tragedies have the Shakespearean freedom. Some of his characters are drawn with mastery, and their passions are delineated with skill. His lyrics, expressive of political feeling and hastily written, are not without merit. He rose high in political circles at Venice and became Podestà of Vicenza, but, falling into disfavor, he had to seek refuge in France in 1796. In 1802 he played a part in the legislative body at Milan. Consult his *Opere drammatiche* (Bologna, 1804-05) and his *Poesie e lettere*, edited by Biadego (ib., 1883); C. Pugliesi, *G. Pindemonte nella letteratura e nella storia del suo tempo* (Milan, 1905).

PINDHAREES, pīn-dā'rēz, or **PINDARIS** (Marathi, *Pindhāri*, *Pendhāri*, plundered, from *pendha*, bundle of grass + *hāri*, one who takes). The name of marauding companies who remained in arms after the fall of the Mogul Empire. They received no pay, but kept whatever they were able to plunder. Eventually, between 1804 and 1817, they became in effect a formidable warlike state, dangerous to English rule, and the terror of the native populations. In the year 1816 alone they destroyed 339 villages in British territory. The next year Lord Hastings, with forces amounting to 120,000 men and 300 guns, completely routed the united Mahratta and Pindhāree armies, consisting of 200,000 men and 500 guns. From this blow the Pindhārees did not recover.

PIN'DUS. A general name applied to the mountain range of north Greece, between Epirus and Thessaly, and to the branches issuing from it. See GREECE.

PINE (AS *pin*, from Lat *pinus*, Skt. *pīrn*,

PINES

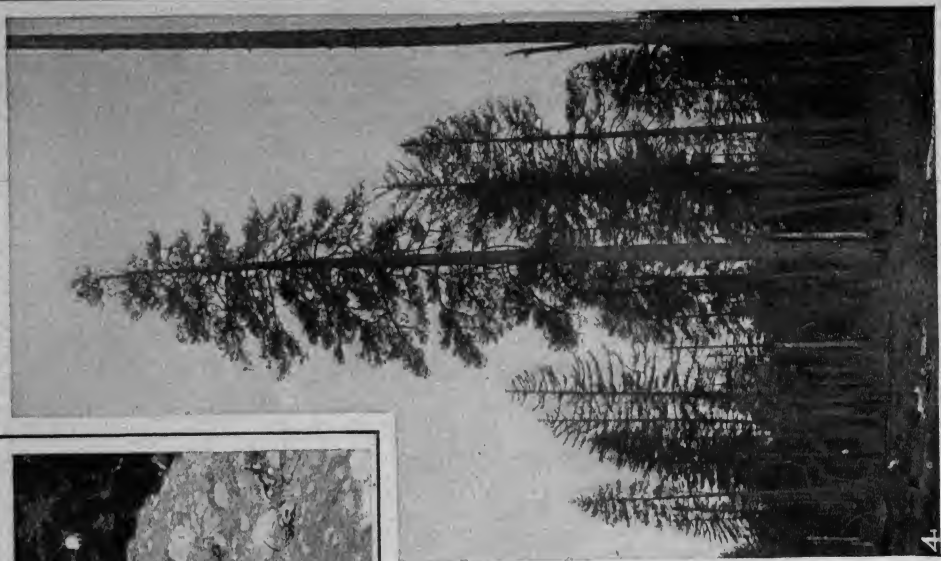


PITCH OR YELLOW PINE (*Pinus palustris*).
Saw Palmetto in foreground.



WHITE PINE (*Pinus strobus*).

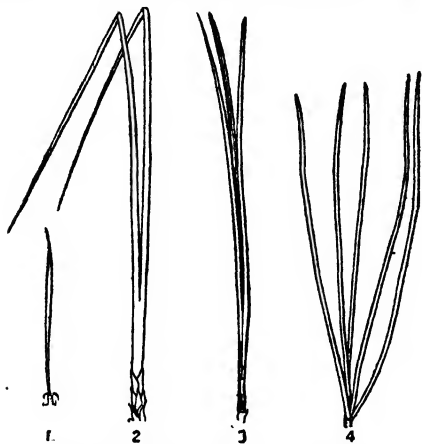
PINES



1. DWARF PINE. (*Pinus Pumilio*).
2. SUGAR PINE. (*Pinus Lambertiana*).

3. BARK OF BULL PINE (*Pinus ponderosa*).
4. BULL PINE (*Pinus ponderosa*).

pine; connected with Gk. *πινυς*, *pitys*, OIr. *ith*, grain, Skt. *pitu*, sap), *Pinus*. A genus of trees of the family Pinaceæ, about 80 species being recognized. Nearly two-thirds of the species are natives of the northern part of the Western Hemisphere, the others occurring in the temperate and subarctic portions of Europe, Asia, and in Africa, extending as do some of the American species into the tropics upon the high mountains. The genus is readily distinguished by narrow, linear, needle-like leaves, growing usually singly or in clusters of two, three, or five, surrounded at their bases by a sheath of membranous scales; and in bearing its seeds in cones which usually mature the second year, some species the third



GROUPING OF PINE NEEDLES IN SHEATHS.

1, *Pinus monophylla*; 2, *Pinus pinaster*; 3, *Pinus sabina*; 4, *Pinus lambertiana*.

or later years. Pines embrace some of the most ornamental and useful trees, their size varying from shrubby specimens, which usually grow at high elevations or latitudes, to trees of great size.

Pines grow in almost every kind of soil and situation, from the bleak mountain side to the plain of almost pure sand. They are more or less gregarious in habit and frequently cover extensive areas to the almost total exclusion of other species, as in the pine barrens of North America. The thickened epidermis and reduced surface of the needles check transpiration and fit the trees admirably for the situations in which they often grow.

One of the most scientific systems of classification, that given by Engelmann in the Transactions of the St. Louis Academy of Science for 1882, is based upon rather technical characters. By others artificial groupings are made, based on the number of leaves in the cluster and the position and character of the cones. The following scheme, adapted from Veitch, shows the relationships of some of the more common species:

Strobus, leaves in bundles of five; cones pendulous; scales thin, blunt; seeds winged—*excelsa*, *lambertiana*, *monticola*, *strobilus*.

Cembra, leaves in fives; cones erect or horizontal; seeds large, obscurely winged—*albicaulis*, *balfouriana*, *cembra*, *flexilis*.

Edulis, leaves in bundles of one to five; cones subterminal; scales thickened; seeds large, very obscurely winged—*monophylla*, *parryana*, *edulis*, *cembroides*.

Tæda, leaves in threes; cones subterminal or lateral; scales much thickened, with sharp prickles; seeds winged—*coulteri*, *palustris*, *ponderosa*, *tæda*.

Pinaster, leaves in twos; cones lateral, often clustered, mostly persistent; scales thickened, blunt or spiny—*contorta*, *echinata*, *muricata*, *pinaster*.

Sylvestres, leaves in twos; cones subterminal, small, mostly falling off; scales slightly thickened; seeds with elongated wings—*banksiana*, *halepensis*, *resinosa*, *sylvestris*.

The white pine (*Pinus strobus*) is one of the most important timber trees of North America. Its range extends from Newfoundland to Minnesota and southward to the mountains of Georgia. It attains a height of 75 to 150 feet, with a diameter of 4 feet. The wood is white or light yellow, soft, straight-grained, and not very resinous, although some resin is obtained from it. It is easily worked and is largely used in building, cabinetwork, etc., being especially in demand for doors, frames, window sash, blinds, shingles, etc. This tree is becoming scarce in the northern United States and the adjacent parts of Canada. It is one of the most rapid-growing coniferous trees and as an ornamental tree has no superior in the northeastern part of the United States. It is propagated from seed, and the young seedlings required some shade. It is not considered as hardy as the Scotch pine, but is longer lived. This species has been extensively planted in Europe, where it is commonly known as the Weymouth pine.

The yellow, long-leaved, or Georgia pine (*Pinus palustris*), a tree of the widest distribution and the greatest economic importance of all in the South Atlantic and Gulf States, ranks second among American pines. It is found in the sandy and gravelly soil from a region near Norfolk, Va., in a belt about 125 miles wide, to Texas, following the contour of the coast, and is readily distinguished by its long leaves, 9 to 15 inches long, and its cones, which are rather larger than those of other species that accompany it. The average height of the mature tree is about 100 feet, with a diameter of from 2 to 3 feet, tapering very gradually. The wood is heavier and stronger than that of any other pine on the market. The layer of sapwood is rather thin, and the heartwood is prominently marked by the annual rings. The timber is used in all kinds of building, being especially adapted to ship carpentry, bridge building, flooring, etc. Large quantities are exported annually, and the building operations of the Southern States are almost wholly dependent on it. The tree is very resinous, and wherever the sapwood is laid bare there is an abundant flow of resin, which is used largely in the manufacture of naval stores, turpentine, rosin, pitch, tar, etc. The industry ranks second only to the lumber interests. The leaves are utilized for the production by distillation of an oil closely resembling the oil of turpentine, and for the production of pine wool, made by boiling with alkalies, the resulting fibre being used in upholstering.

Two species associated with the Georgia pine in its lower limits are the Cuban pine (*Pinus heterophylla*), very similar to the Georgia pine in size and manner of growth, but considered somewhat less valuable, and the loblolly or old field pine (*Pinus tæda*). The loblolly pine springs up in abandoned fields, soon affording

a supply of timber and wood for fuel, the quality of which varies widely with the conditions under which it is grown, approaching the long-leaved pine in quality when grown in the forest, but considered inferior when grown



LOBLOLLY OR OLD FIELD PINE (*Pinus taeda*).

in open fields. Another valuable species of the Southern and Eastern States is the short-leaved pine (*Pinus echinata*), a tree that attains a height of 75 to 120 feet, with a diameter of about 2 feet, and that ranges from New Jersey and Pennsylvania through southern Illinois to Arkansas and eastern Texas, in some places occurring in almost pure forests. The wood is heavy, hard, coarse-grained, but strong, and is largely used for the framework of buildings, weatherboarding, railway ties, car and other building. It is less resinous than the long-leaved pine, but in importance ranks next to that species in the South. The jack pine or scrub pine of the Northern States is *Pinus divaricata* or *Pinus banksiana*. It abounds from New Brunswick to the Mackenzie River and southward about the Great Lakes, furnishing the cover to the extensive pine barrens of that region, especially in Michigan. It is of little value except for fuel. Next to the white pine perhaps the most valuable species in the North is the red or Norway pine (*Pinus resinosa*), which is found from the Gulf of St. Lawrence to Manitoba and south to Minnesota and Pennsylvania. It occurs as trees 60 to 100 feet tall and 2 feet in diameter, often forming extensive forests upon dry sandy soils. The wood is light, hard, elastic, resinous, and durable except when in contact with the ground. Its uses are similar to those of the short-leaved pine farther south. The Northern pitch pine (*Pinus rigida*), which occurs throughout the northeastern portion of the United States and adjacent Canada and as far south as Tennessee and Georgia, is of little value except for fuel and charcoal, but, although rich in resin, it is little used, the Georgia or yellow pine yielding the principal supply of the market. The Jersey or scrub pine, that abounds in barrens from Long Island to southern Indiana and southward to Alabama, is *Pinus virginiana*.

Among the important species of the Pacific region may be mentioned the sugar pine (*Pinus*

lambertiana) and the bull pine (*Pinus ponderosa*). The former is one of the largest of the genus, the trees attaining a height of 150 to 300 feet and more than 10 feet in diameter. It occurs through Oregon and California. The tree trunks are straight and without branches for a considerable portion of their height. The timber is of excellent quality, solid, straight-grained, does not warp, and is easily worked, so that it is in demand for finishing lumber and cabinetwork. The tree exudes a resin which when burned has a sugar-like flavor, hence the name. The seeds of this and many other species of Western pines are eaten in considerable quantities as nuts. The bull pine, which has several well-marked varieties of diverse utility, is found from the Rocky Mountains to the Pacific coast, where it attains a height of 100 to 150 feet and a diameter of 5 to 6 feet; occasional trees are found 250 feet high and 10 feet in diameter, but it is rather smaller in the Rocky Mountain region. In the Pacific coast region the timber is heavy, hard, strong, and fine-grained; farther inland it is coarser-grained, harder, and more brittle. The lodge-pole pine, so called on account of its former use, is *Pinus contorta murrayana*. It is found from Alaska to California and eastward through the Rocky Mountain region, where the trees often grow in great numbers almost to the exclusion of other species. In the southwestern part of the United States are four species known as Piñon pines (*Pinus parryana*, *Pinus cembroides*, *Pinus monophylla*, and *Pinus edulis*). These various species found from Colorado and Utah to Texas and California are chiefly known for their large edible seeds called piñons. These are eaten as nuts (see NUT). The trees are for the most part small and of little value except for their seeds and for fuel. Among the Mexican species of pines the most valuable and interesting are *Pinus ayacahuite* and *Pinus montezumae*, trees of considerable size, the former somewhat resembling the white pine of the United States.

In Europe the most valuable as well as the most widely distributed species are *Pinus sylvestris*, *Pinus laricio* with its varieties, and *Pinus halepensis*.

The Scotch pine or Scotch fir (*Pinus sylvestris*) occurs in immense forests, sometimes mixed with spruce fir, in some European countries, and is the only species indigenous to Great Britain. It attains a height of 80 to 100 feet and a diameter of from 2 to 4 feet and is frequently seen with very large branches resembling trunks. It is of quick growth and has been known to attain the age of 400 years. Its very resinous and durable timber, known as red deal and red pine, is highly valued, being used in house and ship carpentry. There is great difference, however, in the timber grown in different soils and situations, inferior white, soft, and comparatively worthless grades being produced in rich soils and sheltered situations. Several varieties yield very superior timber. The Scotch pine is valuable also on account of its turpentine, tar, pitch, and resin. Oil of turpentine is sometimes distilled from the cones and the leaves, which last have also been used in Germany for the manufacture of a towlike substance called *Waldwolle* (forest wool), suitable for stuffing cushions, etc.

The black or Corsican pine or black fir (*Pinus laricio*, or *Pinus nigra*), a native of Austria,

but found throughout southern Europe, is another species closely allied to the Scotch pine. It is remarkable for its very long leaves and its content of resin, which is more abundant than in any other European tree. It often attains a height of 140 feet upon sandy soils and has been employed to prevent sand drifting. Its timber is of little value, but a great part of the turpentine of the maritime districts of France is obtained from it. It yields also part of the Burgundy pitch in the market. The Aleppo pine (*Pinus halepensis*), a native of the south of Europe, Syria, etc., is a very graceful tree of moderate size, with slender leaves in pairs. It yields a liquid resin or turpentine, which is extracted from it in Provence and elsewhere and sold as Venice turpentine. The wood is extensively used in the Levant for shipbuilding. The pinaster or cluster pine (*Pinus pinaster*) is another important European species. It is found on the shores of the Mediterranean and also in the Himalaya and in China. Like the black fir, it has been largely used in France for covering waste sandy tracts. The timber is of inferior quality, but it yields large quantities of resin and Bordeaux turpentine.

The stone pine (*Pinus pinea*), a tree with a broad umbrella-shaped head, forms a characteristic feature of the scenery of the Mediterranean and is very often introduced in paintings. It is the *Pinie* of the Germans, the *pignon* of the French. The seeds, which do not ripen till the fourth year, are large, abound in a fixed oil, and when fresh have a sweet taste resembling that of almonds, like which they are used in Italy and other countries. Their use, however, is almost entirely confined to the countries in which they are produced, as they very soon become rancid. The wood is useful and beautiful. The cembra pine or Swiss pine (*Pinus cembra*), which grows in the central part of Europe and the south of Siberia, is a stately tree, with more persistent lower branches than in most pines. It has rigid leaves in groups of five and produces edible seeds (cembra nuts), which, although extracted with difficulty, are much used in Siberia, this fruit being so much prized that trees are often cut down to obtain it. The cembra pine yields a pellucid, whitish oil, resembling oil of turpentine, and known as Carpathian balsam. The Himalaya Mountains abound in pines, some of which rival in magnificence those of northwest America. The Bhotan pine (*Pinus coveisa*), much resembling the white pine in botanical characters and attaining a height of 90 to 120 feet, abounds in Bhotan, but is not found in the neighboring countries of Sikkim and Nepal. The wood is durable, close-grained, and so resinous as to be used for flambeaux and candles. The cheer pine (*Pinus longifolia*) of India, where it is often cultivated as an ornamental tree, is of graceful appearance. It is abundant on the crests of hills in the lower Himalaya, growing at a lower elevation than other pines. It is much valued for its resin, and the wood is used in India as a substitute for European deal. Most of the turpentine produced in India is from this and the preceding species. *Pinus insularis*, a species occurring on the higher elevations in the Philippines, has a wood resembling the yellow pines of the United States, and it is of considerable importance for building purposes. Of the European species introduced in the United States, the Scotch pine has proved best adapted to the

climate and soils. It is frequently planted as an ornamental. *Pinus laricio* has been introduced into the United States, and its variety *austriaca*, known as the Austrian pine, appears especially adapted to the prairie regions. The dwarf pine (*Pinus pumilio*) is an alpine species whose stems are usually prostrate.

Bibliography. Pinchot and Graves, *White Pine* (New York, 1896); Gifford Pinchot, *Primer of Forestry* (2 vols., Washington, 1903-09); G. F. Schwarz, *Longleaf Pine in Virgin Forest* (New York, 1907); G. B. Sudworth, *Forest Trees of the Pacific Coast* (Washington, 1908); G. R. Shaw, *Pines of Mexico* (Jamaica Plain, Mass., 1909); R. T. Baker, *Research on the Pines of Australia* (Sydney, 1910); A. T. North, *The Yellow Pine* (St. Louis, 1913); J. S. Bates, *Chemical Utilization of Southern Pine Waste* (Montreal, 1914); G. R. Shaw, *The Genus Pinus*, published by the Arnold Arboretum (Jamaica Plain, Mass., 1914); H. S. Betts, "Western Pines as a Source of Naval Stores," in *United States Department of Agriculture, Bulletin No. 116* (Washington, 1914); "European Pines," in *New Miscellaneous Bulletin*, No. 6 (London, 1915).

PINE, ROBERT EDGE (1730 or 1742-90). An English portrait and historical painter, born in London. He was the son of John Pine, the engraver, and probably his pupil. He painted portraits, such as those of George II, of the Duke of Northumberland, and of Garrick (in the National Portrait Gallery); a series of scenes from Shakespeare, some of which afterward appeared in *Boydell's Shakespeare*; and historical compositions, including "Lord Rodney Aboard the *Formidable*" (Town Hall, Kingston, Jamaica). About 1784 he came to America and settled in Philadelphia, where his time was completely taken up with portraiture. Among his sitters were General Gates, Charles Carroll, Robert Morris, George Read, Thomas Stone, Mrs. Reid (Metropolitan Museum, New York), and Washington (1785). The portrait of Washington was engraved for *Irving's Life of Washington*, but it is weak in characterization. An historically interesting canvas "Congress Voting Independence," now in the Historical Society, Philadelphia, was begun by Pine and completed by Edward Savage. After Pine's death many of his pictures were collected in the Columbian Museum in Boston, since destroyed by fire. Consult Hart, *Congress Voting Independence* (Philadelphia, 1905).

PINEAL (pin'-e-al) **BODY** (from Lat. *pinea*, pine cone, from *pinus*, pine), or **EPIPHYSIS**; sometimes called the pineal gland. The pineal body is an unpaired, upward and forward outgrowth of the midbrain of vertebrates. It appears as a small, ovoid body 6 millimeters in length, of a reddish-gray color, projecting downward and backward between the anterior pair of corpora quadrigemina. Its function has only lately become known. Experimental researches seem to indicate that the structure is a gland, or at least has an internal secretion, which is believed to influence during early life the mental and physical growth, the development of the reproductive organs, and the deposition of subcutaneous fat. Dana and Berkeley report a favorable influence in stimulating the mental development of backward children. Comparative anatomists speak of the pineal body as a rudimentary sense organ—probably an eye. In many fossil mammals and reptiles a depression or

hollow in the parietal bone occurs known as the parietal foramen, which is thought to have contained a rudimentary eye. This view is supported by the fact that in some lizards, and especially in the New Zealand sphenodon (see TUATARA), a parietal organ of this kind is well developed, although it lies beneath the skin and is doubtfully functional. Where the parietal eye is thus developed, it is connected with the brain by a special nerve, and both are formed from the epiphysis. In other cases, where there is no parietal eye, the epiphysis is frequently quite short and is sometimes hollow, the cavity being known as the pineal ventricle. Consult C. P. McCord, *The Pineal Gland in Relation to Somatic, Sexual, and Mental Development* (Chicago, 1914). See ORGANO-THERAPY.

PINEAPPLE (AS. *pinappel*, from *pin*, pine + *appel*, apple). The fruit of *Ananas sativus*, the pineapple plant, which grows from 2 to 4 feet high, producing a single axis to which are attached long, stiff, rough-edged sword-shaped leaves. The individual plant produces only a single very fragrant and palatable fruit, which varies greatly in size, 4 to 5 inches being the usual diameters and 6 to 10 inches the prevailing lengths of ordinary market specimens. Very large specimens may weigh 15 to 20 pounds. The pineapple is a native of tropical America and is widely grown in warm climates. For-



PINEAPPLE (*Ananas sativus*).

merly it was an important European greenhouse crop, and the fruits thus produced were of superior quality; but with the improvement of transportation facilities less attention is given to its culture under glass than formerly. The West Indies, Bahama Islands, Florida, Hawaii, the Azores, and parts of northern Africa are the principal regions of production for European and American markets. Queensland supplies the Australian market. According to the thirteenth census Florida produced 778,644 crates of pineapples, worth \$734,090, in 1909. Owing to keen competition with the West Indies, production is not increasing rapidly in Florida. On the other hand, Hawaiian canned-pineapple shipments have increased from 2000 cases in 1901 to 1,500,000 cases in 1913. The value of canned pineapples shipped from the Hawaiian Islands to continental United States was in 1913 \$3,566,000, and in 1915 \$5,986,000, and of pineapple juice \$43,073. The value of pineapples shipped from Porto Rico to the United States in 1915 was \$1,754,000. The value of the Porto Rico crop now amounts to over \$1,250,000 annually. The pineapple succeeds only

in regions where frosts do not occur. A climate having an alternate wet and dry season, with a mean annual temperature of 75° F. to 80° F., appears most favorable. In Queensland the best pineapples are grown in localities having a mean less than 70° F. The plant requires a porous, well-drained soil; otherwise it thrives on a great variety of soils. In Florida the best pineapples are grown on a fine sandy soil, analyzing 94 to 99 per cent silica, and on such soils heavy fertilizing is necessary. Pineapples rarely produce seed. They are propagated commercially by setting out the crown at the top of the fruit, slips from the base of the fruit, suckers from near the base of the stalk, and ratoons from the roots. Suckers are most commonly planted, since these usually produce a crop of fruit in from 14 to 18 months. Crowns or slips require a year longer to come into bearing. The plants are set in rows about 3 feet apart and 18 to 36 inches distant in the row. Once established, a pineapple plantation will endure 8 to 10 years without resetting, suckers replacing the old plants. Little cultivation other than the scuffle hoe is required. Within recent years pineapples have been grown extensively in Florida under sheds. These sheds are built of lath spaced 2 or 3 inches apart and nailed to a light framework 6 to 7 feet high. They protect the plants from frost and excessive heat and greatly improve the quality of the fruit. The cost of putting them up prohibits their use except for the finest varieties. Consult, for an account of the greenhouse cultivation of pineapples, Thompson, *Gardener's Assistant*, vol. v (new ed., by Watson, London, 1902); for outdoor methods and growing under sheds Rolfs, "Pineapple Growing," in *United States Department of Agriculture, Farmers' Bulletin 140* (Washington, 1901). See HAWAIIAN ISLANDS.

PINEAPPLE, VEGETABLE. See MUSKMEION.

PINEAPPLE FAMILY. A family of monocotyledonous plants. See BROMELIACEAE.

PINEAPPLE OIL. See BUTYRIC ESTER.

PINE BARREN MOSS. See PYXIE.

PINE BLUFF. A city and the county seat of Jefferson Co., Ark., 42 miles by rail south by east of Little Rock, on the Arkansas River and at the junction of the St. Louis Southwestern and the St. Louis, Iron Mountain, and Southern railroads (Map: Arkansas, C 3). It is the seat of the State Colored Normal College. Among other fine edifices are Merrill Institute with a gymnasium and free library, the opera house, the courthouse, and fraternal society buildings. The State Fair Association holds annual fairs here. A fine bridge spans the river at this place. The centre of a fertile agricultural section largely interested in cotton growing, Pine Bluff is an important commercial and manufacturing city. It carries on an extensive cotton and lumber trade and has large wholesale interests. Its industrial plants include railroad shops of the St. Louis Southwestern, cotton compresses, cottonseed-oil and meal mills, boiler and sheet-iron works, a foundry, feed mills, large lumber and stave mills, furniture factories, a hardwood-flooring mill, etc. Pop., 1900, 11,496; 1910, 15,102; 1915 (U. S. est.), 17,060.

PINE FINCH, LINNET, or SISKIN. A small North American finch (*Spinus pinus*), closely related to the goldfinch. The upper parts are variegated black and buff; the under parts white, tinged with buff and heavily streaked

with black. It is found throughout North America, wintering as far south as the Gulf and breeding mostly north of the United States, but is erratic in its movements, being abundant some winters and perhaps not seen again for several years. The nest is built in coniferous trees, of twigs and rootlets, and is lined with down and hairs. The eggs are usually four in number, bluish white, thinly spotted with reddish brown. The pine finch feeds on seeds and buds and resembles the goldfinch in habits, but is less sprightly, and its notes are less musical. In England the pine grosbeak is often called pine finch. See GROSBEEK.

PINE GROSBEEK. A large finch (*Pinicola enucleator leucura*) of northern North America, which visits the United States in winter. In general color the male is mottled rose-red above and ashy on the undersurfaces, with two white bands across the wing. The female is ashy gray, with yellowish brown on the crown and rump. This bird lives in the evergreen forests and feeds on the seeds of the pine and spruce. See Plate of BUNTINGS AND GROSBEEKS.

PINE GROUSE. One of the names of the blue or dusky grouse of western America (*Dendragapus obscurus*). See GROUSE.

PINE INSECTS. The insect fauna of the pine is very extensive. In Europe nearly 300 species are found on trees of the genus *Pinus*, and all but about 20 feed on different parts of the tree. In the United States nearly 200 have been recorded, but the total number will probably prove to be nearly double that number. Of the pine insects known in the United States prior to 1890, the species that had occasioned locally the most direct and perceptible injury was the pine moth of Nantucket, but the most widely destructive kinds were the timber borers, and of these the larva of *Monohammus confusor*, known as the sawyer in the Southern pine districts, did the most damage. Next to that insect the white pine weevil (*Pissodes strobi*) does the most damage to timber, since it deforms the trees, causing the growth of gnarled, many-headed trees which except for these attacks would have grown straight and would have been fitted for masts or for the best timber. Some pine borers are noted for their longevity, and may live for years in articles of furniture or in the timbers of houses, if for some cause prevented from pairing and laying their eggs. Much damage has been done in different parts of the United States by bark-boring beetles of the family Scolytidæ, and especially by the species of the genus *Dendroctonus*, which also seriously affect spruce. The pine-destroying beetle of the Black Hills (*Dendroctonus ponderosa*) has done within recent years an enormous amount of damage to the rock pine in the Black Hills region, bringing about a great loss not only to the owners of the timber, but also to the mining interests of that region, from the lessening of the timber supply. The principal attack appears to be made in August, when the beetles migrate in swarms from the dying trees and settle on the living ones, which they attack and infest in large numbers from near the base to the upper part of the main trunk or stem. Remedial work is largely a part of forest management and includes a careful consideration of the proper date for cutting.

The wood engraver bark beetle (*Xyleborus cœlatus*) is the most common and most pernicious of the insects affecting the forests of white pine

in the State of New York and of the yellow pine in the more southern States. *Xyleborus pubescens* feeds mainly under the bark of *Pinus inops*, and the coarse-writing bark beetle (*Tomicus calligraphus*) works in the pitch pine and to a lesser extent in the white pine. There are perhaps 20 more species of scolytid bark beetles which have similar habits in connection with pine trees. Of the flat-headed borers of the family Buprestidæ, about 20 have been found to attack the pine, while rather more than 20 longicorn beetles of the family Cerambycidæ live in the larval state in the wood of the trees of this genus. The white pine weevil (*Pissodes strobi*) lays its eggs in the bark of the topmost shoot of young trees. The larvæ mine in the wood and pith, causing the shoot to wither and die, thereby occasioning a crook or fork in the body of the tree at this point. It is fatal to the growth of these trees, and no effective remedy has been discovered.

The pine moth of Nantucket (*Retinia frustana*), referred to above, causes the death of pine trees in large numbers. The moth lays its eggs on the twigs and the young larva burrows into the wood, ultimately causing the death of the trees. Many insects affect the leaves of pine, including about a dozen sawflies. In the Northwest a butterfly (*Pieris menapia*) lays its eggs upon pine, and the larvæ destroy the leaves. Another butterfly (*Thecla niphon*) does similar work on the pines in Florida and Georgia. Two of the hawk moths, *Lipara combycoides* and *Lipara pinetum*, feed in the larval state upon pine foliage; and the larva of the imperial moth (*Eacles imperialis*) has similar habits. Many other caterpillars are also to be found doing similar work. The larva of a curious little tineid moth (*Gelechia pinifoliella*) mines in the pine needles, and the larva of one of the gall midges (*Diplosis resinicola*) lives in the pitch which exudes from injuries to the pitch pine. Another gall midge (*Diplosis pini-rigida*) makes small galls at the bases of the needle clumps. Several plant lice and scale insects also feed upon the pine, the most notable being the pine-leaf chermes (*Chermes pinifoliæ*) and the pine-leaf scale insect (*Mytilaspis pinifoliæ*), the latter frequently covering pine needles in various parts of the United States with its minute white scales.

Consult A. S. Packard, *Report on Insects Injurious to Forests* (Washington, 1890), and Hopkins, *Insect Enemies of the Pine in the Black Hills Forest Reserve* (ib., 1902).

PINEL, pē'nél', PHILIPPE (1745-1826). A French physician, born at Saint-André (Tarn). He studied medicine at Toulouse (M.D., 1773) and later at Montpellier, and in 1778 removed to Paris. He received a prize for his book on insanity, and was appointed physician of the Bicêtre and the Salpêtrière (asylums). By recognizing insanity as a disease and discarding the old barbarous methods of treatment Pinel won fame. In the Salpêtrière he instituted the scientific study of insanity through a class of clinical medicine, which he continued after his appointment to the chair of medical physics and hygiene, and subsequently to that of pathology, at the School of Medicine in Paris. He was elected to the Institute in 1803. His most valuable works are *Nosographie philosophique* (1798; 6th ed., 1815); *Traité médico-philosophique sur l'aliénation mentale* (1801; 2d ed., 1809), one of the classics of medical

literature, *La médecine olinique* (1802; 3d ed., 1815).

PINE LINNET, or **SISKIN**. See **PINE FINCH**.
PINELO, pé-nà'lo, ANTONIO DE LEÓN. See LEÓN PINELO.

PINE MARTEN. The American marten (*Mustela americana*). See **MARTEN**, and Plate of **FUR-BEARING ANIMALS**.

PINE MOUSE. An American meadow mouse (*Microtus pinetorum*), rusty brown in general color, and distinguished by its long, silky, mole-like fur. It is more subterranean in its habits than others of our mice, and frequently makes long tunnels under the surface, showing raised roofs like those of the moles. It is especially numerous in the pine-wood districts of the Southern States, but in related forms it ranges also north into southern New England and westward throughout the lower Mississippi valley. Consult Vernon Bailey, *North American Fauna*, No. 17 (Washington, 1900), and Stone and Cram, *American Animals* (New York, 1902).

PINERO, pi-nar'ō, SIR ARTHUR WING (1855-). An English dramatist. He was born in London, May 24, 1855, of Jewish ancestry on his father's side. He began the study of law, but abandoned this to become an actor and made his first appearance on the stage at the Theatre Royal, Edinburgh, in 1874. Two years later he went to London and joined the Lyceum Company under Henry Irving, of which he remained a member for five years. He began his career as a playwright with a comedietta called *£200 a Year*, which was produced at the Globe Theatre in 1877. This was followed by a long list of plays, the extraordinary cleverness and technical dexterity of which soon won him recognition as one of the most popular English dramatists of his time. His first success was *The Money Spinner* (1880). The most significant of his early work, however, is the series of successful farces produced between 1885 and 1893. These were *The Magistrate* (1885), *The Schoolmistress* (1886), *Dandy Dick* (1887), *The Cabinet Minister* (1890), and *The Amazons* (1893). After a brief excursion into sentimental comedy in *The Weaker Sex* and *Sweet Lavender*, both of which were written during the period of the farces, Pinero tried his hand at serious drama in *The Profligate*; but it was not till the production of *The Second Mrs. Tanqueray* (1893) that he made a pronounced success in this field. This piece is somewhat artificial in texture and hardly measures up to the standard of some of his later work, but at the time it marked a distinct advance over contemporary English drama and was generally heralded as a masterpiece. It was the first of his plays to receive recognition abroad and is still perhaps his most widely known work, though both *Iris* (1901) and *Mid-Channel* (1909) are superior in tragic quality and craftsmanship. Pinero's best comedies are *The Benefit of the Doubt* (1895), *His House in Order* (1906), and *The Thunderbolt* (1908). Pinero was knighted in 1909. In his later plays, such as *Preserving Mr. Pannure* (1911) and *The Mind-the-Paint Girl* (1912), he returned to the lighter mood of his earlier period. Pinero's greatest contribution to the drama of his country was technical. As a dramatic craftsman he had no rival among English playwrights of the period. His plays were as popular in the United States as in Britain. Consult: prefaces to his *Plays* by Salaman (London, 1891-95);

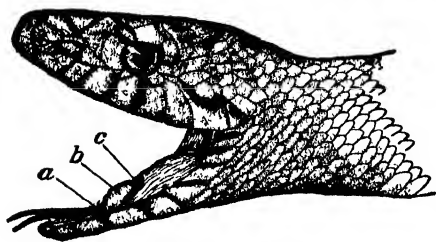
H. H. Fyfe, A. W. Pinero (ib., 1902); William Archer, *Real Conversations* (ib., 1904); E. E. Hale, Jr., *Dramatists of To-Day* (6th ed., New York, 1911); P. P. Howe, *Dramatic Portraits* (ib., 1914).

PINEROLO, pé-nà-rō'lo (Fr. *Pignerol*). A town in the Province of Turin, Italy, situated on a hill on the left bank of the Chisone, 22 miles southwest of Turin by rail (Map: Italy, A 2). It has an eleventh-century cathedral, a lyceum, a Gymnasium, a technical institute, and a theatre. There are manufactures of woollens, cottons, silks, leather, and paper, and a trade in grain, wine, cattle, fruit, and lumber. Pop (commune), 1901, 18,250, 1911, 20,174, (town), 12,600. Originally a possession of a local Benedictine abbey, Pinerolo passed to the house of Savoy in 1188 and later became a residence city. It was taken by the French in 1536 and in 1631, when it was strongly fortified; its castle was made the prison for the Man with the Iron Mask, Fouquet, and Lauzun. Pinerolo was returned to Savoy in 1696 and its fortifications were demolished in accordance with the Treaty of Utrecht.

PINES, ISLE OF. An island south of Cuba. See **ISLE OF PINES**.

PINES, ISLE OF. A small island in Melanesia, situated near the south extremity of New Caledonia (q.v.), of which it is a dependency. It has an area of 58 square miles, is mostly barren, except along the coast, and has a population, exclusive of convicts, of about 600 New Caledonians and a few European settlers. Since 1872 it has been a French penal station.

PINE SNAKE, or **BULL SNAKE**. A large, robust, colubrine serpent (*Pituophis melanoleucus*) of the southerly half of the United States, often exceeding 6 feet in length, and of a glistening creamy white, blotched with dark brown. It derives its name from the pine lands in which it is found, emits a strong, disagreeable odor, and feeds on eggs, birds, and small mammals. It is harmless, but makes a loud hissing and sometimes even bellowing noise when disturbed, to which fact it owes its name bull



HEAD OF PINE SNAKE.

Showing formation of glottis. a, sheath of tongue, b, epiglottis; c, glottis.

snake; but why it should also be called thunder-and-lightning snake is not so easily explained. Three or four similar species and varieties inhabit dry, sandy regions throughout the interior of the country, especially in the Southwest and in Mexico. These are brighter in color than is the Eastern species. Consult: Lockwood, "The Pine Snake," in *American Naturalist*, vol. ix (Boston, 1874), Abbott, *A Naturalist's Rambles* (New York, 1884); E. D. Cope, *Crocodilians, Lizards, and Snakes* (Washington, 1900); R. L. Ditmars, *The Reptile Book* (New York, 1914). See Plate of **SNAKES**, **AMERICAN HARMLESS**.

PINE SWIFT. The name in the northern coast States of the fence lizard (*Sceloporus undulatus*). It is very common in the pine woods from New Jersey southward. It is entirely harmless and has many interesting habits. See FENCE LIZARD.

PINE-TREE FLAG. A flag used in the Massachusetts Colony, as early as 1700, at first red or blue with a pine tree on a white field, and later white bearing a pine tree in the middle and the motto, "An Appeal to Heaven." This was the flag carried by the first war vessels commissioned by Washington at the beginning of the Revolution.

PINE-TREE MONEY. Money coined in Massachusetts from 1652 to 1682, in the values of a shilling, sixpence, and threepence, so called from the rude figure of a pine tree on one face, while the other bore "New England," with the date.

PINE-TREE STATE. Maine. See STATES, POPULAR NAMES OF.

PINEVILLE. A city and the county seat of Bell Co., Ky., 156 miles east-southeast of Lexington, on the Cumberland River and on the Louisville and Nashville Railroad (Map. Kentucky, G 6). It is a shipping point for the Cumberland coal-mining region. Lumber also is shipped and staves and coke are manufactured. In the centre of the town there are remains of a prehistoric mound. Other noteworthy features include Mayme Johnson Seminary, Continental Hospital and Sanitarium, county infirmary, courthouse, city hall, and the railroad station. Pineville was settled in 1868. Pop., 1900, 2077; 1910, 2161.

PINEVILLE. A town in Rapides Parish, La., on the Red River, opposite Alexandria, and on the lines of the Chicago, Rock Island, and Pacific, the Louisiana and Arkansas, and the Louisiana Railway and Navigation Company (Map Louisiana, E 4). It is the seat of the Louisiana Baptist College and the State hospital for the insane and contains a national cemetery. The town is engaged chiefly in lumbering and farming. The electric-light plant is owned by the municipality. Pop., 1900, 617; 1910, 1212.

PINEY DAMMAR. See DAMMAR.

PINEY TREE. See CALOPHYLLUM.

PINEY VARNISH. See DAMMAR.

PING-PONG. A modified form of lawn tennis (q.v.), played on a table marked to scale, after the model of a full-sized lawn-tennis court. The bat is usually covered with a thin skin like a battledore, but resembles a lawn-tennis racket in shape, while the ball is usually made of light celluloid. Any kind of table may be utilized, but its size should not be less than 5 feet, 6 inches by about 3 feet, nor larger than 10 × 5. The regulation table is 9 × 5, the height of the net, which is stretched across the middle of the table, being regulated at the ratio of three-fourths of an inch for every foot in the length of the table. The game is for two players standing one at each end of the table. The player who first delivers the ball is called the server and the other the striker out. At the end of each game the striker out becomes the server and vice versa. The service is strictly underhand, delivered from behind the end of the table. The ball served must drop on the table top anywhere beyond the net, and is then in play. If it drop into the net or off the table, it counts to the striker out. There is no second

service as in lawn tennis, but the system of scoring is the same as in that game. The game became popular in the United States about 1900, but as it was inherently uninteresting and required comparatively little skill, its vogue was short-lived, and within a few years it had virtually disappeared. Consult Parker, *Ping Pong* (New York, 1902).

PINGYANG, ping'yang' (Korean *P'yeng*, *Phyong*, or *P'yung-Yang*), now called Heijo by the Japanese. A walled city of Chosen (Korea), capital of the Province of South Heian, and one of the most important cities in the country after Keijo, the capital (Map: China, N 4). It stands in an undulating plain on the right bank of the Daido (Tadong) River, about 36 miles above its mouth. Its walls are 20 feet high, run parallel with the river for about 2½ miles, and are loopholed and battlemented and pierced with several gates with imposing towers. The streets are laid out at right angles. Pingyang (or Heijo) is the most ancient city of Chosen, Ki-ja (see KI-TSE), the reputed founder of Korean civilization, having landed here some time after 1122 B.C. The superstitious notion is held by Koreans that the city is boat-shaped (representing the craft on which Ki-ja arrived from China) and that wells must not be sunk within it lest the vessel be scuttled. The water supply of the inhabitants is, therefore, carried in from outside. Two large stone posts about 1½ miles above the town are supposed to be the mooring posts. The tomb of Ki-ja is one of the sights of the city. The Japanese are engaged in extensive improvements. Pop., 1912, 51,832 (7868 Japanese, 43,250 Koreans, and 714 foreigners).

The city is regarded as the military key to Chosen, and in consequence it has suffered much from war. A great battle was fought here in 1593 between the Chinese troops sent to succor Chosen during Hideyoshi's invasion and the Japanese troops under Konishi; and the principal battle of the Japanese-Korea-Chinese War of 1894-95 was fought here Sept. 16, 1894, resulting in the utter defeat of the Chinese, who lost 4000 men. A handsome stone monument in memory of the Chinese General Tso, who led the cavalry, has been erected on the spot where he died, and on a lofty knoll within the city is a monolith erected by the Japanese to their dead.

PINHOEN, OIL OF. See PHYSIC NUT.

PINK (from *pink*, to puncture, to pierce; so called from the jagged edges of the petals), *Dianthus*. A genus of about 70 annual and perennial plants of the family Caryophyllaceæ, chiefly natives of Europe and the temperate parts of Asia. Their beautiful and often fragrant solitary or clustered flowers are borne at the ends of the branches, and have attracted admiration in all ages, some of the species having been long cultivated in gardens. Their cultivation has given rise to many varieties, including single and double forms of many different colors. The species *Dianthus caryophyllus*, including the well-known and widely cultivated carnation (q.v.), clove pink, picotee, or grenadine, is native to southern Europe, where it is found growing wild on rocks and old walls. The common pink, also called feather pink (*Dianthus plumarius*), is the parent species of many cultivated forms. This has always been a favorite ornamental plant on account of its hardness and the beauty and fragrance of its

blossoms. It differs from the foregoing species in having rough-margined leaves and fringed petals. Nearly allied to the common pink is *Dianthus superbus*, found in moist places in some parts of Europe and often grown in flower borders. The maiden pink (*Dianthus deltoides*) is a low-growing perennial frequently cultivated for its dense masses of leaves and flowers. The China or Indian pink (*Dianthus chinensis*) has long been in cultivation and numerous dwarf and double and single flowered varieties of many varied colors have been developed. The sweet William, or bunch pink (*Dianthus barbatus*), is a popular species of easy cultivation and abounds in country gardens. Its flowers are crowded into dense flat clusters at the top of the stem. The varieties are exceedingly numerous and include many highly developed forms. The Deptford pink (*Dianthus armeria*) is a small European species which has become



PINK (*Dianthus plumarius*).

naturalized in the eastern United States. Pinks prefer a rather light, sandy loam soil. They are propagated from seeds and from cuttings. If the plants are to flower the same season, the seeds are sown in heat during February, transplanted when the plants are large enough, and hardened gradually to cool culture until May, when they are set out. Seeds sown in the open during summer produce plants which blossom the following year. The young plants of outdoor sowings are also transplanted as soon as they become crowded and are finally transferred to their flowering position in autumn. Many varieties of pinks are grown as greenhouse plants, and these are usually increased by layers or cuttings. See PLATE OF CARNATIONS; and Colored Plate of MOUNTAIN PLANTS.

PINKERTON, ALLAN (1819-84). An American detective, born in Glasgow, Scotland. In 1842 he emigrated to Canada to escape punishment for his part in the Chartist movement (see CHARTISM), and the same year settled in Chicago, where he opened a detective agency. Before the outbreak of the Civil War he had become widely known, and in 1861 he guarded President Lincoln during the latter's journey to Washington for the inauguration. Soon afterward he was commissioned to organize the

Federal Secret Service Department, of which he was made the head. During all this time he continued his private detective agency in Chicago, and established branch agencies in other important cities. When the changed industrial conditions that followed the war led to strikes and violence, he organized a force of armed men which he hired out to employers and corporations for the protection of their property. This force, known as Pinkerton's Men, played a conspicuous part in some of the most important labor disturbances of the last quarter century, notably in the suppression of the Molly Maguires (q.v.) and in the Homestead strike. (See HOMESTEAD.) Among other well-known cases with which Pinkerton was connected were the capture of the robbers who took \$700,000 from the Adams Express Company's safe on a New York, New Haven, and Hartford Railroad train, on Jan. 6, 1866, and the dispersion of a gang of murderers who for a number of years terrorized all southern Indiana. His sons, Robert A. (died 1907) and William A., carried on their father's work. Allan Pinkerton wrote several books on subjects connected with his experiences, among them: *The Molly Maguires and the Detectives* (1877); *Criminal Reminiscences* (1878); *The Spy of the Rebellion* (1883); *Thirty Years a Detective* (1884); *History and Evidence of the Passage of Abraham Lincoln from Harrisburgh, Pa., to Washington, D. C., on the 22d and 23d of February, 1861* (1891).

PINKERTON, JOHN (1758-1826). A Scottish antiquary and author, born in Edinburgh. He was educated at Lanark grammar school, was articled to a writer to the signet in Edinburgh, abandoned law for literature, settled in London (1781), and resided during his last years in Paris. Among his numerous publications are: *Rimes* (1781); *Select Scottish Ballads* (1783), professing to be ancient, but later admitted by Pinkerton to be partly his own; *Essay on Medals* (1784); *Letters of Literature* (1785); *Ancient Scottish Poems never before in Print, from the Manuscript Collection of Sir R. Maitland* (1786); *The History of Scotland from the Accession of the House of Stuart to that of Mary, with Appendices of Original Documents* (2 vols., 1797). This last work, though valuable for its matter, is disfigured by an attempt to rival the style of Gibbon. Consult his *Literary Correspondence*, edited by Dawson Turner (London, 1830).

PINK'EYE, or INFLUENZA. An infectious disease prevalent among horses, often occurring as an epizootic. The term is also employed for conjunctivitis (q.v.). See INFLUENZA (in animals); FRIT.

PINKNEY, pink'nī, EDWARD COATE (1802-28). An American poet, born in London, England. He was the son of William Pinkney, the well-known Maryland lawyer and orator, and was born while the latter was commissioner in England. He served in the navy (1816-24), was admitted to the Baltimore bar, in the latter year, was made professor of rhetoric and belles-lettres in the University of Maryland, and edited the *Marylander* (1827); but he is best known for a tiny volume of *Poems* (1825), since highly praised by Poe and others and several times reprinted.

PINKNEY, WILLIAM (1764-1822). An American statesman, born at Annapolis, Md. He was educated at King William's Seminary (afterward St. John's College), studied law

under Justice Samuel Chase (q.v.), and was admitted to the bar in 1786. In 1788 he was a member of the State Convention to ratify the Federal Constitution and was elected to the House of Delegates the same year. In 1796 he was appointed by Washington a commissioner to England to determine the compensation due American merchants under the Jay Treaty (q.v.) and secured a claim of \$800,000 for Maryland on the Bank of England. He returned to practice law in Baltimore in 1804 and was elected Attorney-General of Maryland in 1805. In 1806 he was again sent to England as a commissioner to treat in conjunction with James Monroe, then Minister to England, regarding the violation of rights of neutrals. On the return of Monroe in 1807 Pinkney remained as resident Minister until recalled at his own request in 1811. On his return he was elected to the Maryland State Senate, but was appointed Attorney-General of the United States by President Madison. He commanded a regiment of riflemen during the War of 1812 and was wounded at Bladensburg. He was a member of the national House of Representatives in 1815-16 and in the latter year was appointed Minister to Russia and Special Envoy to Naples. He resigned in 1818 to practice law and was engaged in many important cases. In 1820 he was elected to the United States Senate and opposed the admission of Missouri. Consult Henry Wheaton, "Life, Writings, and Speeches," in Jared Sparks, ed., *American Biography*, vol. v (new ed., New York, 1902); also William Pinkney, *Life of William Pinkney* (1853).

PINK ROOT. The root of a species of *Spigelia* (q.v.).

PIN MONEY. In English law, a sum of money paid periodically by a husband to his wife, to be expended for dress and other personal expenses. The origin of the term has never been traced satisfactorily, but writers of some authority assert that it was derived from an ancient tax levied in England for the purpose of supplying the Queen with pins. The practice of providing such an annual sum for the wife's separate use, by means of a marriage settlement, was at one time quite common among the wealthy classes in England. Out of this allowance the wife was supposed to maintain the dignity of her station in the matter of dress, ornament, private benefactions, etc. It was therefore intended to be spent and not accumulated. Accordingly, if a husband pays the wife's personal expenses directly, it is a bar to a claim for arrears of pin money, and, in any event, while the wife continues to cohabit with the husband she cannot collect the arrears for more than one year. However, if she lives separately, all arrears may be collected. If the wife saves anything out of her pin money while living apart from her husband, it becomes her separate property; but if they are living together, such accumulation goes, with her personal property generally, to the husband's representatives on his death, unless he had consented to his wife's saving for her own benefit.

The custom of providing pin money is no longer common in England and never gained favor in the United States, although there are some early decisions which apply the English law to such allowances. A weekly or monthly sum paid to the wife for household expenses, etc., does not correspond to pin money. Sums

given to the wife by the husband voluntarily from time to time, when he does not indicate that they are to be used for a specific purpose, are usually considered as gifts and become the separate property of the wife. See **DOWRY**; **HUSBAND AND WIFE**.

PINNA (Lat. *pinna*, *pina*, from Gk. *πίνα*, *πίνα*, sort of mussel). The popular and generic name of a group of marine mussels with very thin, wedge-shaped shells, tapering to a point at the hinge. The byssus is remarkably long and silky, and by it the species affix themselves to submarine rocks and other bodies, sometimes even to sandy or muddy bottoms. The best-known species is *Pinna nobilis*, of the Mediterranean, the byssus of which was occasionally used by the ancients for fabrics, chiefly as an article of curiosity.

PINNACE (Fr. *pinace*, *pinasse*, from It. *pinassa*, *pinazza*, pinnace, pine, made of pine, from *pino*, from Lat. *pinus*, pine). Formerly a small two-masted vessel, fitted to be propelled by oars as well as sails, and usually employed as a tender to large ships. The French armed pinnace was usually of 60 to 80 tons and carried one large 24-pounder and about 100 men. In the United States navy the term "pinnace" is not used, but in the British navy it is still applied to a large carvel-built boat similar to the American sailing launch.

PINNACLE (Lat. *pinna*, *pinna*, dim. of *pinna*, feather, wing, pin, pen). A termination of tapering form crowning some architectural member. Unknown to ancient art, it was occasionally used in the mediæval Mohammedan and Romanesque styles, but it did not become common until the Gothic period, when it became a most important decorative element of architecture. It crowned buttresses, filled in the four corners of square towers at the spring of the polygonal spire, and rose as a termination of piers or shafts at gable corners. Pinnacles were square, polygonal, or circular and had spires or gables crowned with finials; they had either an open story or solid masonry with engaged colonnettes and arcades. Sometimes they included a niche containing a statue. The main pinnacles on the buttress piers of Rheims Cathedral are 80 feet high. They are of different sizes and of the greatest variety of form and decoration.

PINNATED GROUSE. The prairie chicken. See *Prairie Chickens*, under **GROUSE**.

PINNIPE'DIA (Neo-Lat. nom. pl., from Lat. *pinna*, feather, fin + *pes*, foot). A section of Carnivora, comprising seals, otaries, and walruses, in which the fore and hind limbs are short and expanded into broad, webbed swimming paddles. The hind feet are placed very far back, nearly in a line with the axis of the body, and somewhat incorporated with the tail by the integuments. The body is elongated and covered with short fur or hairs and terminated by a short conical tail. The five toes of each foot are united by the skin and form powerful swimming paddles. The tips of the toes are armed with claws, but they have little power for land locomotion, the typical seals being able only to drag themselves along when out of the water. The ears are small, often only indicated by apertures, which the animal can close under water. The dentition varies, but teeth of three kinds are always present. The canines are always long and pointed, and the molars have sharp cutting edges.

The pinnipeds include three families—the earless seals (*Phocidae*), the eared seals or otaries (*Otariidae*), and the walruses (*Trichechidae*). The seals differ from the walruses by having incisor teeth in both jaws and moderate-sized canines, and from the otaries by the absence of ears and inability to use the hind limbs on land. The eared seals, sea lions, or otaries differ from the typical seals by having small conical ears and in the greater use of the limbs, especially the hind limbs, so that they are enabled to execute a sort of walk. Consult J. A. Allen, *History of North American Pinnipeds* (Washington, 1880), and F. E. Beddard, "Mammalia," in *Cambridge Natural History*, vol. x (London, 1902). See SEAL; WALRUS.

PINN'NULE (from Lat. *pinnula*, dim. of *penna*, feather, wing, pin, pen). In a pinnately compound leaf, one of the subdivisions of the first divisions or *pinnæ*. The term has most frequent application among the ferns.

PINOCHLE, pē'nok'-l (Ger., of uncertain etymology). A game of cards. The modern and more generally adopted game is played with a specially prepared pinochle pack of cards, or with two packs of cards, of which only the ace, king, queen, knave, ten, and nine of each pack are kept—a total of 48 cards in all. The dealer deals four cards at a time, until each player has 12, the next or twenty-fifth card being turned up for trump and placed exposed by the side of the undealt cards. One thousand points are game, and the value of announcements as follows: eight aces, 1000; eight kings, 800; eight queens, 600; eight knaves, 400; double pinochle (i.e., two queens of spades and two knaves of diamonds), 300; ace, ten, king, queen, and knave of trumps, 150; four aces of different suits, 100; four kings of different suits, 40; pinochle (i.e., queen of spades and knave of diamonds), 40; king and queen of trumps (styled a royal marriage), 40; king and queen of any suit not trumps (styled a marriage), 20. The count on each separate hand is 250, including 5 for queens, 5 for kings, 10 for tens, 10 for aces, and 10 for the player who takes the last trick. Generally speaking, the laws of *béziqne* will be found to govern most matters of detail in pinochle.

In the three-handed game all the cards are dealt by four at a time, the last card being turned up for trumps. Should a nine be turned up, the dealer scores 10 points; but where that does not happen, either of the other players holding a nine of trumps may exchange it for the trump card and claim the 10 points, the eldest hand having precedence. Each player "melds," i.e., announces whatever he has in hand, before a card is played, but cannot meld after a trick is taken. Four-handed pinochle is played in the same manner as for three players.

PIÑON, pē'n'yón. A kind of pine (q.v.).

PIÑONCILLO, pē'n'yón-sel'yó. See **PHYSIO NUT**.

PINOS, pē'nós. A town of the State of Zacatecas, Mexico, 65 miles southeast of the capital of the state (Map: Mexico, H 6). It is in the midst of an important mining region, with extensive gold and silver deposits, and manufactures large quantities of mescal. Pop., 1900, 7667.

PINSK. A district town in the Government of Minsk, Russia, situated in a marshy region on the Pina, about 105 miles east of Brest-Litovsk (Map: Russia, C 4). It has a Roman

Catholic church of the fourteenth century, a Realschule, and manufactures of matches, lumber, and leather. The commercial importance of the town has greatly decreased since the construction of the Polissie railways. Pop., 1911, 37,000. Pinsk is mentioned as early as the eleventh century and was formerly the capital of a separate principality. It was captured by the Germans in 1915. See **WAR IN EUROPE**.

PINSUTI, pēn-sōo'tē, CIRO (1829-88). An Italian-English teacher of singing and composer, born in Siena. He studied under his father and played in public at the age of 10. Subsequently he went to England and studied the pianoforte and composition under Potter and the violin under Blagrove. In 1845 he entered the Conservatorio of Bologna, where he became Rossini's pupil. In 1848 he returned to England and gave singing lessons in London and Newcastle. He was also appointed in 1856 professor of singing at the Royal Academy of Music, London. During his life his songs, which number about 200, were very popular. He died in Florence.

PIN'TA. The name of one of the three caravels in which Columbus made his first voyage to America. It was commanded by Martín Alonso Pinzón.

PINTA'DO. See **PETREL**.

PIN'TAIL, or **SPRINGTAIL DUCK**. A common, widespread, and highly esteemed duck (*Dafila acuta*), characterized by the long tapering tail of the drake. It is about equal in size to the mallard, but is more slender. The head is brown, with a white line on each side extending down the neck; the back and sides are marked with waving lines of black and grayish white; the lower parts white; the elongated central tail feathers black. It is a native of all the northern parts of the world, migrates southward in winter, and is a regular visitant of many parts of the Atlantic coasts. It frequents fresh-water lakes and ponds also and is common in winter in the valley of the Mississippi. It breeds from Iowa northward, but chiefly in the interior, and is not known as a summer resident anywhere on the Atlantic coast. Its winter range extends southward to the Mediterranean and the Gulf of Mexico and even to Africa and the West Indian islands. Consult Baird et al., *Water Birds of North America* (Boston, 1884).

Some other birds having long sharp tails are called pintails by sportsmen, as, especially, one of the European sand grouse (*Pterocles setarius*). See **PLATE OF EGGS OF WATER AND GAME BIRDS**.

PINTO, pēn'tó. See **SERPA PINTO**.

PINTO, FERNÃO MENDES (1509 or 1510-83). A Portuguese traveler and one of the first white men to visit Japan (1542-43). He was born at Montemor-o-Velho (Beira). Embarking for the East Indies, his ship was captured by the Turks, and he was sold as a slave. According to his own account his adventures were remarkable. He spent 21 years in Asia and Africa, was 13 times taken prisoner and 17 times sold as a slave. While returning in a pirate junk from Cochín-China to China, his vessel was separated from her companions, and after 23 days on the open sea he sighted the island of Tane (Tanégashima), one of the Luchu Islands (q.v.), where the strangers were welcomed and given a house. They surprised the people by their firearms, which the Japanese quickly imi-

tated, making over 600 guns within five and a half months, and on one of his three later visits to Japan Pinto found firearms in a great many places. To this day, among Japanese country folk, a pistol is called Tanégashima. Hokusai (q.v.) pictured Pinto and his companions with their firearms in his albums. Returning to Portugal in 1558, Pinto lived at court several years and died near Lisbon, July 8, 1583. His posthumous work, *Peregrinação*, appeared at Lisbon in 1614 and was at first supposed to be a sort of Robinson Crusoe romance, but in the main, and apart from personal items, its statements have been confirmed by modern research. An English rendering by Cogan appeared in London in 1663, 1692, and 1891 (*Adventures and Voyages of Ferdinand Mendez Pinto*).

PINTSCH GAS. See GAS, ILLUMINATING AND FUEL; PINTSCH SYSTEM.

PINTSCH SYSTEM. A process for the production of compressed oil gas, used chiefly for lighting railway cars. Ordinary coal gas burned at the pressure of street mains gives an illumination of about four candles to each cubic foot, while oil gas at the same pressure yields about 16 candles to the cubic foot. Compression and storage of coal gas produce a diminution in illuminating power in consequence of the deposition of the rich oily hydrocarbons. This loss, however, is much less in oil gas than in coal gas. Oil gas is made by subjecting petroleum or shale "distillate oils" to a temperature of 900° C. in small D-shaped iron retorts. The retorts are placed one above another and connected in pairs. Oil flows into one end of the upper retort through a siphon and drops into a loose sheet-iron tray, where it vaporizes, the vapors passing downward into the lower retort, where cracking occurs. The gas is of a pale straw color; if brown, the heat has been too intense. The tar and carbon residues are of little value. Young improved the process by washing the gas with the oil as it flows into the retort. By this method no tar is formed; only retort carbon remains. After purification and compression the gas is ready for use. It is usually stored in steel tanks under a pressure of 5-6 atmospheres. The tanks are suspended under railway cars. Before consumption a special valve reduces the pressure to 1-2 inches of water. Either plain or inverted mantle burners may be used. Oil gas is also largely used for lighting buoys as aids to navigation. These buoys are arranged to hold a charge of gas which will last for several months of continuous burning. At 125 pounds' pressure to the square inch, 1 foot of oil gas is equal in illuminating power to about 5 feet of coal gas. The use of oil gas for the purpose of illuminating railway cars is therefore much more economical, and the Pintsch system finds extensive use on all the leading railway lines in the United States. See GAS.

PINTURICCHIO (PINTORICCHIO), pên-tōō-ré-kê-ō (It., little painter) (1454-1513); properly BERNARDINO DI BETTO. One of the foremost Umbrian painters of the early Renaissance. A native of Perugia, he studied under Fiorenzo di Lorenzo (q.v.) and was later influenced by Perugino (q.v.). His early work was at Perugia, Spello, and Siena and consisted chiefly of altarpieces, like the "Holy Family with St. John" (Siena) and "Christ Crucified, with St. Jerome and Christopher" (Borghese

Palace, Rome). In 1480-83 he collaborated with Perugino in the frescoes of the Sistine Chapel, himself painting the "Baptism of Christ" and the "Journey of Moses." Then (1483-84) came his first independent work, the frescoes in the Ara Cœli, Rome, of the life of St. Bernardino. Among other frescoes which he painted in Rome the most important are those of the Borgia apartments in the Vatican, rendered in a courtly and luxurious style. His work at Rome was interspersed with decorative commissions in various Central Italian cities, the most charming and characteristic of which are those of the Collegiata at Spello. Towards the end of his life he removed to Siena, the scene of his most important commission, the lavish decorations of the cathedral library (1503-08), with scenes from the life of Æneas Sylvius (Pope Paul II). The two portraits of the knight Alberto Arringieri (1504) in Siena Cathedral are in his very best style. His last important frescoes were on the vaulting of the choir of Santa Maria del Popolo, Rome (1505). The most important of his later panel pieces are the reliquary (Berlin) and "Christ Bearing the Cross" (1513, Milan). He died and was interred at Siena, where he possessed a house and left a wife and daughters. Though reputed of mean appearance and a man of little culture, he was popular alike with courts and the public.

Pinturicchio was the foremost historical painter of the Umbrian school, as Perugino was its chief religious painter. His winning art represents the quaint medievalism of Umbrian painting applied to decorative work of a more mundane character. At best, it is simple in form, attractive in color, and charming in landscape. Though often marred by raised gold and stucco the decorative effect is usually fine. The assistance of the numerous pupils of his large *bottega* (workshop) is discernible in his frescoes, for which he always furnished the design.

Bibliography. August Schmarsow, *Bernardino Pinturicchio in Rom* (Stuttgart, 1882); Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects*, vol. ii (ed. by Blashfield and Hopkins, New York, 1896); Ernst Steinmann, *Pinturicchio*, *Künstler-Monographien*, No. 37 (Bielefeld, 1898); E. M. Philipps, *Pinturicchio* (London, 1901); Corrado Ricci, *Pinturicchio*, translated by Florence Simonds (ib., 1902); Bernhard Berenson, *Central Italian Painters of the Renaissance* (ib., 1902); *Masters in Art*, vol. v (Boston, 1904), containing an exhaustive bibliography; E. H. and E. W. Blashfield, *Italian Cities* (New York, 1912).

PINUS. A genus of trees. See CONIFERÆ; GYMNOSPERMS; PINE.

PIN/WHEELS. See PYROTECHNY.

PIN/WORM. One of the nematode worms (*Oxyurus vermicularis*) parasitic in the large intestine and rectum of man, especially in children. It is a small white worm, ½ inch long or less and very slender. The females are larger than the males. Unlike many nematodes, the pinworms reproduce directly in their host and have no alternation of hosts or of generations. The eggs are very minute and must be taken into the body with the food or at least through the mouth, but the exact manner of infection is not really known. The presence of these worms is often a matter of discomfort,

but they are rarely so numerous that their presence is a source of danger to the person afflicted.

PINKSTER FLOWER. See Plate of AZALEAS AND RHODODENDRONS.

PINZÓN, pên-thôn', FRANCISCO MARTÍN. A Spanish navigator, brother of Martín Alonso and Vicente Yáñez Pinzón (q.v.). He was pilot of the *Pinta* on the first voyage of Columbus.

PINZÓN, MARTÍN ALONSO (c.1440-93). A Spanish navigator, companion, and patron of Columbus. He was born at Palos and attained distinction as a bold and skillful sailor, making distant and profitable voyages as far as the Guinea coast. Through Fray Juan Pérez de Marchena, prior of the convent of La Rábida, he came to know Columbus, and his enthusiasm was aroused by the scheme of the great navigator. With his brothers, Vicente Yáñez and Francisco Martín, he exerted his influence in the seafaring town of Palos to enlist men for the voyage across the Atlantic. The brothers also lent Columbus the money which he was to contribute as his share of the cost of the expedition. On the first voyage of discovery Martín Alonso commanded the *Pinta*. As the fleet was coasting along Cuba after the landfall on Guanahani Island, he separated from the other two ships in disregard of the Admiral's orders (Nov. 21, 1492). He was the first to discover the island of Haiti, on the coast of which he rejoined Columbus Jan. 6, 1493. He was met with severe reproaches by Columbus, who charged him with treasonable intentions. On the return voyage Martín Alonso, in the *Pinta*, parted company with the *Niña* during a storm and, reaching Bayona in Galicia, sent word to the Spanish monarchs to announce his return. Then he set sail for Palos, which he reached on the same day as Columbus (March 15). As the result probably of privations encountered during the voyage, he died soon after at the convent of La Rábida. Consult: Cesáreo Fernández Duro, *Colón y Pinzón* (Madrid, 1883), J. M. Asensio, *Martín Alonso Pinzón, estudio histórico* (ib., 1893); Henry Vignaud, *Histoire critique de Christophe Colomb* (2 vols., Paris, 1911).

PINZÓN, VICENTE YÁÑEZ (c.1463-c.1523). A companion of Columbus. He was born in Palos and was a younger brother of Martín Alonso Pinzón (q.v.). Pinzón commanded the *Niña* on the first voyage and afterward became the greatest of the seafaring men engaged in discoveries in the New World, down to the time of Magellan. He appears to have made several independent voyages before the close of the century, and it is probable that in 1497 (accompanied perhaps by Vesputius) he reached the mainland of America (discovering Central America) almost simultaneously with Cabot's landing on the continent. He sailed again on Nov. 18, 1499, returning the following September, after discovering the coast of Brazil and the mouth of the Amazon and sailing westward and northward at least as far as Costa Rica. In 1505 he was appointed to command an expedition to the Spice Islands, but Portuguese intrigues prevented him from sailing, and instead he was given charge over the fortifications to be erected in Porto Rico. He was also made Governor of the island with authority to colonize it. He was, however, a seaman rather than

an administrator, and he spent the next year or two trying to get the command of a fleet, which the Portuguese prevented, as he was suspected of designs against their territories. In June, 1508, he finally got away, with Juan Díaz de Solís. They returned in November, 1509, but no record survives as to where they secured their cargo of gold and other New World products. After 1523 we have no records of Pinzón. Consult Henry Harrisse, *Discovery of America* (London, 1892).

PIOMBINO, pyóm-bé'nó. Formerly an independent principality of northern Italy, now a part of the Province of Pisa. It belonged to Pisa from 1233 to 1399, when it became independent under rulers of the house of Appiani. In 1700 it came into the possession of the Buoncompagni-Ludovisi. It was incorporated with France in 1801, but from 1805 to 1814 was ruled as a principality by Elise Bacciochi, the sister of Napoleon. In 1815 it was united with the Duchy of Tuscany.

PIOMBINO. A town in the Province of Pisa, Italy, situated on a promontory projecting into the Tyrrhenian Sea, 40 miles by rail southeast of Leghorn (Map: Italy, C 3). Its ancient walls and ruins of an old castle still remain. The town has a busy harbor and manufactures ironware and oil. Pop. (commune), 1901, 8309, 1911, 18,703. To the north are Etruscan and Roman remains of the town of Populonia, whose site still preserves the ancient name.

PIOMBO, SEBASTIANO DEL. See SEBASTIANO DEL PIOMBO.

PIONEER (Fr. *pionnier*, OF. *peonnier*, foot soldier, sapper, from OF. *peon*, *paon*, *pion*, foot soldier, Fr. *pion*, pawn, from ML. *pedo*, foot soldier, from Lat. *pes*, foot, ultimately connected with Eng. *foot*). A military mechanic or laborer. Originally pioneers were ordinary laborers of the country in which the army was operating. Their name was undoubtedly derived from the fact that their principal duty was to prepare the way for the advance of the troops, cutting down trees, building bridges, removing obstacles, etc. They were the forerunners of the modern military engineer (see ENGINEER CORPS), the engineers or technical troops of Germany being still known as pioneers. Formerly in the British army there were two pioneers to every company of infantry, who collectively worked under a pioneer sergeant, a regimental staff noncommissioned officer. Their equipment consisted of either a pick, shovel, or an axe, and a one-edged pointed sword, the other edge of which was cut like a saw. On the march or on occasions of ceremony they paraded with the noncommissioned staff and in column of route preceded the band. To be a pioneer a soldier had to be a skilled mechanic and had to pass the pioneer instruction course at Chatham. In the organization of the United States army (1914) a pioneer battalion of engineers is a component part of a division. Such a battalion consists of a headquarters, a supply detachment, and three pioneer companies with attached sanitary troops. Total personnel: 15 officers, 494 enlisted men, commanded by a major. They are equipped with 1 map wagon, 7 wagons for tools and explosives, and a pack train of 24 mules. They are also a part of the engineer corps. See ENGINEERING, MILITARY.

PIONEERS, THE. A novel by James Fenimore Cooper (1823). Though the earliest published, it is the last but one in order of the

Leatherstocking Tales, describing the old age of Natty Bumppo and the death of the Indian, Chingachgook.

PIOBBY, pé'ô'rê', PIERRE ADOLPHE (1794-1879). A French physician, born in Poitiers. He became doctor of medicine in 1816 and in 1840 was appointed professor of pathology and in 1850 of clinical medicine at Paris. He devised a new nomenclature which met with no success and invented the pleximeter for mediate percussion, for which he received the Montyon prize in 1828. (See PERCUSSION.) He wrote: *De la percussion médiate* (1828); *De l'hérédité dans les maladies* (1840); *Traité de médecine pratique* (1842-51), *Traité de plessimétrisme et d'organographie* (1866).

PIOTROKOV, pyô'tr'-kôv. A government of Russian Poland, consisting of eight districts and bounded on the north by the Government of Warsaw (Map: Russia, A 4). Area, 4729 square miles. The surface is mostly level and somewhat undulating towards the south. Coal and iron are found in some parts of the government and mined to some extent. The chief rivers are the Warta and the Pilica. Although the soil is not well adapted for agriculture, this is the chief industry. Stock raising is also of some importance. Textiles represent the leading manufacturing industry, of which Lodz and Piotrokov are the two centres in Russian Poland. The government was occupied by the Germans in 1915 (See WAR IN EUROPE.) Pop., 1913, 2,042,300.

PIOTROKOV. The capital of the government of the same name in Russian Poland, situated on the Warsaw-Vienna Railway, about 16 miles southeast of Lodz (Map: Russia, A 4). One of the oldest towns in Poland, it has a number of old churches and monasteries, an old castle, two Gymnasias, and a fine town hall. The chief manufactures are farm implements and textiles. Pop., 1910, 41,181. Piotrokov is one of the oldest towns of Poland, being mentioned as early as the twelfth century. It was fortified by Casimir the Great and received Magdeburg rights in 1404. It was the scene of frequent riots and in 1577 became the seat of the highest tribunal of Great Poland. Piotrokov was captured and strongly fortified by the Germans in 1915. See WAR IN EUROPE.

PIOZZI, pé-ô't'sé', MRS HESTER LYNCH, better known as MRS. THRALE (1741-1821). A noted friend of Dr. Samuel Johnson. She was born at Bodvel, Carnarvonshire, Wales. In her girlhood she learned Latin, French, and Italian and wrote for the *St James's Chronicle*. In 1763 she married Henry Thrale, a well-to-do Southwark brewer, her senior by 13 years. It was no love match, but on the whole turned out well. Dr. Johnson became acquainted with Mrs. Thrale in 1764 and for 16 years spent week ends and summers at Streatham Park, the Thrale estate. By the society there his eccentricities in dress and manners were toned down, and his natural melancholy was neutralized by the presence of a vivacious and charming woman. In his whole career this is the only bright period. Thrale died in 1781, and three years later his widow married Gabriel Piozzi, an Italian musician. Piozzi was a man of talent and honor, but Johnson was displeased and never again saw his good friend. Immediately after their marriage the Piozzis went to Italy, returning to England in 1787. They lived at Streatham till 1795, then at Bachycraig, Flintshire, Wales, and

afterward on the Clwy. Piozzi died in 1809. Mrs. Piozzi passed her last years mostly at Bath, Clifton, and Penzance, and died May 2, 1821. Her only valuable contributions to literature are *Anecdotes of the Late Samuel Johnson* (1786) and *Letters to and from the Late S. Johnson* (1788). While at Florence in 1785, Mrs. Piozzi associated with the Della Crusicans and wrote for the *Florence Miscellany*, afterward ridiculed by William Gifford (q.v.).

Bibliography. *Autobiography, Letters, and Literary Remains*, ed by Hayward (Boston, 1861); E. Mangin, *Piozziana* (London, 1833); L. B. Seeley, *Mrs. Thrale* (New York, 1891); Evelyn Martinengo-Cesaresco, *Glances of Italian Society in the Eighteenth Century, from the Journal of Mrs. Piozzi* (London, 1892); H. L. T. Piozzi, *Dr. Johnson's Mrs. Thrale* (New York, 1910), *Intimate Letters of Hester Piozzi and Penelope Pennington*, edited by O. G. Knapp (ib., 1914); also James Boswell, *Life of Johnson* (London, 1791, new ed., by Roger Ingpen, 2 vols., New York, 1909), and the *Diary of Madame d'Arblay* (London, 1842-46, new ed. by C. Barrett, 6 vols., ib., 1904-05).

PIP. A nickname of the hero of Dickens's *Great Expectations*, who on the death of his unknown benefactor, the convict Magwitch, instead of gaining the wealth he had anticipated, is reduced to poverty.

PIP. A disease of poultry. See ROUP.

PIPA, pé'pâ (Neo-Lat., from the native name of the Surinam toad). A South American frog (family Pipidae), the Surinam toad (*Pipa americana*), celebrated for its extraordinary method of carrying its eggs in the skin of the back. It is a peculiar, ugly-looking creature. The whole skin is covered with small tubercles and is dark in color on the upper surfaces but whitish on the underside of the body. Everywhere the skin bears papillae, each with a little horny spike and many with a poison gland at the base. The back of the female is furnished with numerous cells or pouches, in which the eggs are hatched and the young undergo all their transformations. It was not until the process was observed by Bartlett, who watched captive specimens in London (*Proceedings of the Zoological Society*, London, 1896, p. 595), that the method of placing the eggs in this curious nursery was understood. The eggs are produced in the early part of the rainy season, when these highly aquatic frogs have plenty of water about them, and at that time it is very difficult to capture them. In the dry season these frogs collect in swamps and ditches and sometimes come close to or into houses. Consult Hans Gadow, *Amphibia and Reptiles* (London, 1901), and G. A. Boulenger, *Reptiles and Batrachians* (New York, 1914).

PIPAL, pé'pal. See BO TREE.

PIPE. An implement for smoking tobacco, opium, etc. See TOBACCO PIPE.

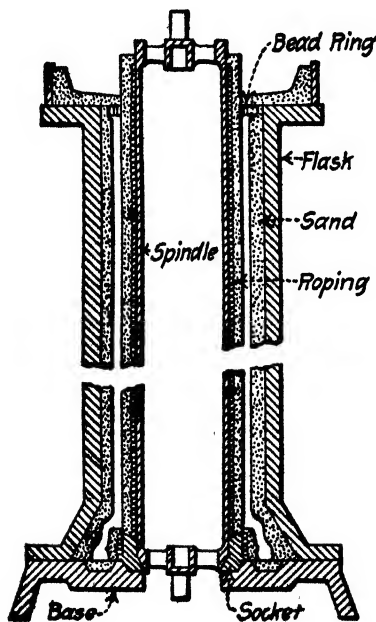
PIPE (AS. *pipe*, from ML. *pipa*, pipe, from Lat. *pipere*, *pipiare*, to pipe, onomatopoeic in origin). An artificial closed channel, or conduit, for liquids, air, or gases, often under high pressures. Pipes are composed of a great variety of materials, according to the uses to which they are to be put and the cheapness of the various materials in a given locality.

Lead Pipes are known to have been used at Babylon, Rome, and Pompeii and, like all lead pipe until recent times, were made from sheets of lead bent to a pear-shaped section, with the

horizontal joint welded or soldered. About the beginning of the sixteenth century the casting of lead pipes was begun in England, the process having been invented by Robert Brooke. In 1790 an English patent for drawing lead pipe was granted, and a machine was built for pressing lead pipe through dies. As the larger sizes of lead pipe have to be very thick to retain their shape and withstand high pressures, and on account of the high cost of lead pipe and for other reasons, such pipe is but little used now in diameters of more than 2 inches or so. Modern lead pipe is pressed through dies in a continuous length. The molten lead is poured into a cylindrical hole in a hydraulic press. In the centre of the hole is a metal rod or core of the same diameter as the pipe. When the metal begins to solidify the press rises and forces the soft, hot lead through a die, the diameter of which corresponds with the interior diameter of the pipe.

Block-tin pipes are made in the same way as lead, except that they are cold-pressed. Most of the block-tin pipe is used in soda fountains, or to convey beer, or in chemical works.

Cast-Iron Pipes. The general process of casting iron is described under **FOUNDING**. It may be said here that in some of the foundries the core is made by winding a spindle with a machine-made hay rope. Over the rope two or three layers of clay are packed successively, after which the clay is shaped in a lathe, then dried in an oven. This core shapes the interior of the pipe. For the exterior a pattern is placed in a compartment known as a flask. Around the pattern tempered clay and sand are rammed to form a mold for the exterior of the pipe.



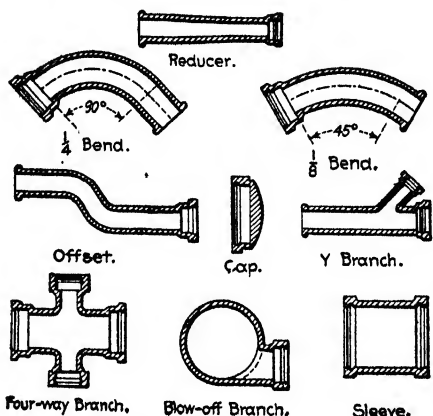
MOLD FOR CASTING IRON PIPE.

The flask is then placed in an oven to dry the sand and clay, after which it is placed in a vertical position, the core is centred within it, and the space between the core and the mold is filled with molten iron. After the core is

drawn and the pipe removed, the latter is coated to prevent corrosion. The standard length of cast-iron pipe is 12 feet, and its diameter ranges from about 2 to 60 inches, with occasional larger sizes. The great thickness of shell, which of course increases with the diameter, makes very large pipe too heavy for use where ready means for handling it are not available. This is partly obviated by casting in shorter lengths.

Clay, Earthenware, or Terra-Cotta Pipe. Near the close of the eighteenth century the manufacture of drain tile began to assume importance in England. Other forms of clay pipe followed soon after, and then came the vitrified clay or glazed stoneware pipe now commonly known as sewer pipe. A machine for the manufacture of clay pipe was built at Ottweiler, Rhenish Prussia, about 1858.

Drain Tiles are commonly mere cylinders of baked clay, designedly porous, and without provision for making joints. Sometimes, however,



SOME OF THE MOST COMMON SPECIAL CASTINGS FOR USE WITH CAST-IRON PIPE.

a short length of semicylindrical baked clay is laid over the abutting ends of the tiles. Clay pipe is made by pressing or otherwise forcing the prepared clay (see **CLAY**) through a die, in the case of drain tile, and then cutting it into short lengths; or it is pressed in a mold, consisting of an outer shell, to form the exterior, and a core for the interior, besides which there is a special mold for the socket. After the socket is formed its mold is removed and the straight portion of the pipe pushed through.

To obtain a glaze, salt is placed in the fire holes of the kiln while the pipe is being baked. Upon being volatilized the salt combines with the silica in the clay.

Wood Pipes. Bored logs were used at Boston, in the first public water-supply system in the United States, in 1652, and at Bethlehem, Pa., in the pumping system of water works built from 1754 to 1761. Most, if not all, of these primitive wood pipes were simply logs with holes bored in their centres, and one end of each log tapered off to fit into the bore hole of the next log. Similar pipes are still used, but only in rural districts. Improvements have resulted in a style of pipe with a smooth circular interior and exterior, an asphalt-coated iron or steel band wound tightly around the pipe to give it strength, and a coating of asphalt over both the bands and wood for preserving the ex-

terior from alternate drying and wetting. The joints are made by boring out one end of each pipe to a larger diameter than the other and turning down the other end to a like exterior diameter, then inserting the small end of one pipe in the large end of the next; or both ends of the pipe may be bored, as described, and the space thus formed may be filled by inserting a short length of pipe just thick enough so that its inner side will be flush with the inside of the main pipe.

To avoid the limitations in size incident to bored logs and to secure still greater facility in transportation and construction, particularly in rough country, pipes built up in place from wood staves are now used. Wood-stave pipe is composed of staves cut internally and on the edges (or radially) to form a conduit of the desired diameter. By breaking joints a continuous pipe is secured. The staves are held together and resistance to any desired moderate pressure is secured by using steel bands or rods, provided with screw ends and nuts for tightening.

Since about 1895 smaller sizes of stave pipe, for which the construction just described is not suitable, have been made by winding them spirally with steel rods under tension by means of a machine; a little later small, wire-wound stave pipe was put on the market.

An investigation of the lasting qualities of wood pipe carrying water, made under instructions from the director and chief engineer of the United States Reclamation Service, was published in the August, 1915, issue of the *Reclamation Record*. It dealt with continuous-stave uncoated fir, continuous-stave uncoated redwood, continuous-stave and wire-wound coated fir, and continuous-stave and uncoated Texas, Colorado, and yellow pine, and showed that a life of 12 to 25 years is possible where complete saturation of the wood takes place.

Wood-Fibre Pipes are made to a limited extent and used for conveying gas, acids, and water under relatively low pressures. They are made from wood pulp. (See **PAPEE**.) A thin sheet of pulp is wound around a core until the requisite thickness is obtained. The pipe thus formed is dried, impregnated with a wood preservative, and then has its ends turned in a lathe to form joints.

Wrought-Iron Pipes. The earliest wrought-iron pipes appear to have been made from an overstock of gun barrels early in the nineteenth century. The small end of one tube was screwed into the large end of the other. The pipes thus made were used to convey illuminating gas. The longitudinal joints were lap-welded. The increasing demand for wrought-iron gas pipe led to the adoption of butt-welded pipes of uniform size and thickness, united by sockets or couplings into which the ends of the pipe were screwed. Like the gun barrels, these pipes were welded by hand, a few inches at a time. In 1825 Cornelius Whitehouse invented a process of butt welding which was in its essentials continued in use through the remainder of the century. He first rounded up the iron plate or skelp, then heated half the length of the pipe, and drew it through two dies by means of a chain. The dies pressed the heated metal together. This patent was bought by James and John Russell, pipe manufacturers, one of whom had just patented a process of butt welding by pressing the edges together, but in which only a few inches could be welded at a time.

With the development of steam engineering larger and stronger pipes were demanded. The Russells bent their energies to meeting this demand by improving on the old lap-welding process already described. This appears to have been about 1835, but, whatever the date, their process for lap welding, like theirs for butt welding, involved the main principles still followed. In the recent process of lap welding pipe and tubes the strips or plates of metal are heated, have their edges beveled or scarfed by passing through rolls, and then drawn through a die and formed with edges overlapping, ready to be welded. The partly made pipe or skelp is now heated a second time and welded by passing it through two rolls, the inner lap resting on a stationary mandrel, which corresponds to a blacksmith's anvil. Finally, the pipe thus made is straightened, threaded, screwed into a coupling, and tested by means of water pressure. Butt-welded pipes are now made by drawing a heated plate, by means of tongs, through a conical-shaped die, thus pressing the edges so firmly together that they unite. The further steps in the process are the same as for lap-welded pipe. Iron pipes exported from the United States in 1914 amounted to \$14,338,000 in value.

Pipes are also *drawn* from hollow or cylindrical ingots formed by passing a heated round billet through diagonal rolls and over a mandrel. By reheating and rolling under pressure the ingot is finally brought down to the desired diameter and thickness. It is then annealed, pickled, and cold-drawn, to give it the desired finish. In the Mannesman process, invented in Europe, and patented in America in 1887, pipe is rolled from a solid but heated bar or rod by means of two tapering rolls and a mandrel.

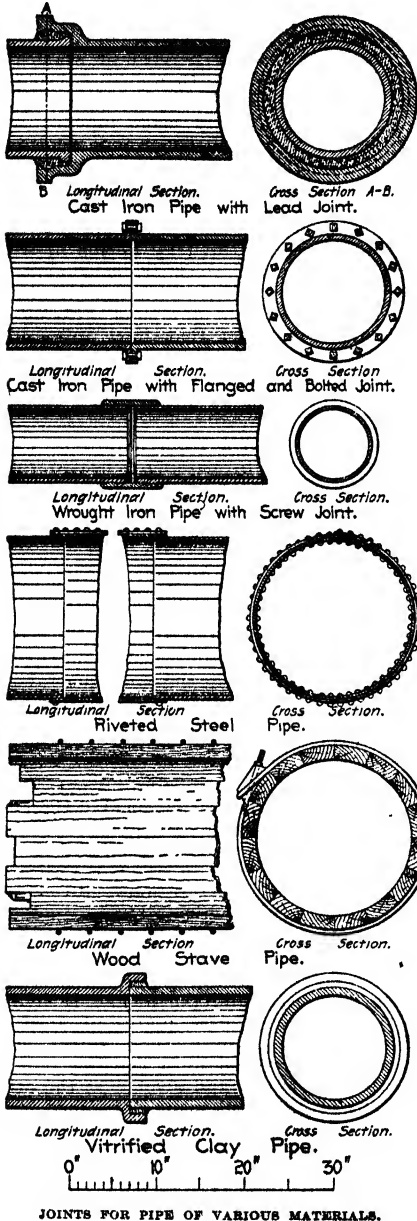
Steel Pipes are made in the same general way as has been described for wrought iron. In addition, they are sometimes cast and are frequently riveted for large sizes, as described below.

Riveted Wrought-Iron and Steel Pipes have their longitudinal and frequently their circular joints riveted instead of welded. Wrought-iron sheets, rounded and riveted, have long been used for stovepipes, and in 1853 a California miner laid a pipe line of ordinary stovepipe to convey water for hydraulic mining. In a few years this sort of pipe, only heavier and better made, was in general use.

Both *spirally riveted* and *spirally welded steel pipe* have been used, and the former is still on the market. In each case plates of steel are wound spirally to form a tube, spiral joints being heated and welded by a machine hammer in one case and lapped and riveted in the other. The sections of pipe thus made are joined in the trench. Steel pipes with *longitudinal locking bar joints* have been used extensively in Australia and the United States. The earliest notable instance, as well as one of the most remarkable pipe lines in the world, is the Coolgardie pipe line, which is 328 miles long and 30 inches in diameter. Water is pumped through it to supply gold fields in the interior, 1313 feet above the source of supply. The pipe is made by bending two plates to semicircular shape and inserting their edges in steel bars with a groove on each side, then applying heavy pressure to both the plates and bars. The circular joints are made with sleeves. The contract for the line was let in 1898. Pipes similar

in construction were introduced into the United States about 1905.

Cement Pipes and Concrete Pipes are made from the materials named. (See CEMENT and CONCRETE.) Cement pipe was molded from sand and cement or cement mortar, but did not come into extensive use. Steel rods and steel nettings



JOINTS FOR PIPE OF VARIOUS MATERIALS.

have been built into concrete pipe to give it greater tensile strength. This form of construction is known as reinforced concrete and is extensively used. Both plain and reinforced concrete are used for large conduits, built continuously in place, instead of being molded in sections.

Pipe Joints may be grouped as calked, screwed, flanged and bolted, and riveted. The

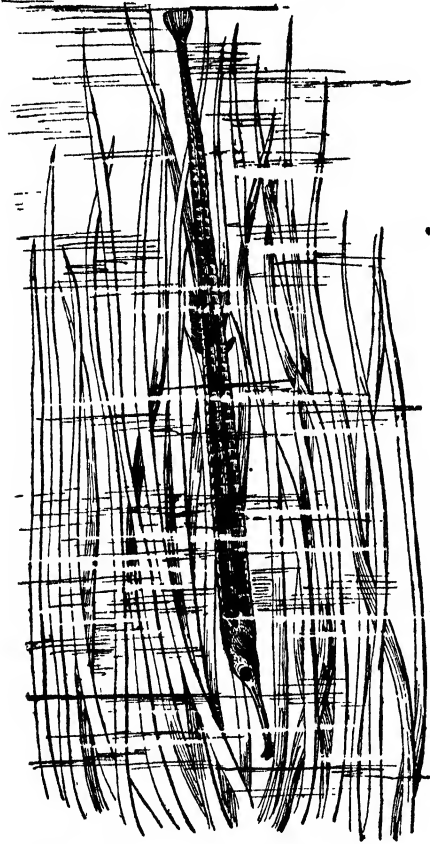
calked joints are used almost wholly for vitrified clay pipe, other than drain tile, and are very largely used for cast-iron pipe. They are sometimes used for steel. Pipes with calked joints generally terminate in an enlarged curved bell or socket at one end and are either the same size and shape as the main pipe at the other end or have a projecting ring. This smaller end is known as the spigot or bell. After one piece of pipe has been inserted in another the space between the hub and the socket is packed with lead or with cement, the lead generally being used for cast-iron pipe. In place of a hub and socket plain-ended pipe may be inserted in sleeves, or pipe of slightly larger diameter, and calked as described. Screwed joints are effected by threading the outer ends of the pipes and screwing them into or upon some form of coupling, also provided with screw threads. Flanged and bolted joints have a projecting ring at each end, with holes drilled through it, parallel to the axis of the pipe. Bolts are inserted in these holes. By using washers or packings of leather, rubber, or soft metal between the flanges, and by turning up the nuts on the bolts until they are tight, very tight joints can be made in this way. Riveted joints have been mentioned in the paragraph on riveted wrought-iron and steel pipes. These joints, longitudinal as well as circumferential, may be made by lapping one edge over the other and riveting the two together; or the two metal edges may be butted against each other, a strap or band placed over the seam, and rivets inserted and headed each side of the seam. The requisite strength of joints is secured by decreasing the space between the rivets and by putting in two or three rows of the same.

Bibliography. The literature of the subject is scattered through the engineering papers, proceedings of engineering societies, and books on the applied arts employing pipe. A paper by Jesse Garrett on "Making Cast-Iron Pipe" in *Journal of New England Water-Works Association* (Boston, September, 1896) contains some interesting historical matter relating to various kinds of pipes used to convey water, besides describing briefly the manufacture of cast-iron pipe. The journal named contains much other material on the manufacture and uses of the various kinds of pipes. Consult also: Crane, "Early History of Gas Pipes," in *Engineering Record* (New York, July 8, 1893), for the wrought-iron pipe; various committee reports on "Coating Cast Iron and Steel Pipes," in *Proceedings of American Society of Municipal Improvements* (Allegheny, Pa., 1897-1900); P. R. Björling, *Pipes and Tubes: Construction and Jointing* (2d ed., New York, 1908); John Sharp, *Some Considerations Regarding Cast Iron and Steel Pipes* (ib., 1914). For a few of the many uses of pipes, see HEATING and VENTILATION; IRRIGATION; SEWERAGE; WATER SUPPLY; WATER WORKS; PIPE LINES.

PIPE CLAY. A term applied to almost any fine clay (q.v.) comparatively free from iron and other impurities, having a grayish-white color, a greasy feel, and high plasticity. Some pipe clays are used for the manufacture of tobacco pipes and white pottery; others are employed for making sewer pipe. Pipe clays are common in the United States and occur in many geological formations, notably the Cretaceous, Tertiary, and Carboniferous. See CLAY.

PIPEFISH. A name given principally to

species of the family Syngnathidae, but applied also to various other species which, like the above, have a long tubular snout. The body is long and slender, and is covered with bony plates firmly connected, so as to form a sort of carapace. The tail is often long and slender and sometimes is used as a prehensile organ. The fins are minute, the pectorals sometimes wanting and the ventrals always. Their food consists of small marine animals and the eggs of fishes, and they may be seen slowly moving about, with curious contortions, poking the long snout into



A PIPEFISH STANDING UPRIGHT IN EEL GRASS.

every crevice in search of food and sometimes assuming a vertical position with the head downward, poking into or stirring the sand. They abound alongshore among the eel grass and when standing on their heads in the midst of it perfectly simulate one of the gently moving blades and are thereby protected from observation. Like the sea horse (q.v.), to which pipefishes are nearly related, the males have brood pouches on the ventral side of the body, usually situated on the underside of the tail, but sometimes farther anterior, formed by two folds of the skin meeting and coalescing in the median line. The young are carried in this pouch until some time after they have escaped from the egg, going out, and returning when alarmed, but at last are turned loose by the pouch bursting. There are about 15 genera and 150 species, small and sluggish, inhabiting the warmer seas, sometimes entering fresh waters. The common pipefish of the Atlantic coast is *Siphostoma fuscum*.

Consult A. C. Gunther, *Introduction to the Study of Fishes* (London, 1880), and G. R. Goode, *American Fishes* (New York, 1888).

PIPE LINES, OIL AND GAS. Wrought-iron or other pipes jointed to form conduits of great length, used to transport petroleum oil or natural gas from the wells or fields to the point of utilization or, in the case of oil, to the refinery or market.

Oil Pipe Lines were first suggested by Gen. S. D. Karns, in November, 1860. His idea was to lay a line from Burning Springs to Parkersburg, W. Va., and let the oil gravitate to the Ohio River, where it could be loaded and shipped. The distance was about 36 miles. The line never was laid. In 1862 J. L. Hutchinson, of New York, laid a siphon over a hill from the Tarr Farm to a refinery at Plumer, Pa. In 1863 he laid a second line, 3 miles in length, through which he pumped oil from the Sherman well to a refinery, but the joint leakage was so great that both these lines were abandoned.

The first successful line was laid in 1865 by Samuel von Syckle, of Titusville, Pa., and was 4 miles in length. Other lines followed, numerous companies were organized, and consolidations were effected. The new mode of transportation met with violent and riotous opposition from teamsters and others interested in hauling oil in wagons and the destruction of or tampering with the pipes was frequent. In 1875 a 4-inch line, about 60 miles long, was laid from the lower oil country to Pittsburgh. The second long pipe line was laid from Bear Creek to Cleveland, Ohio. It was 111 miles long, 6 inches in diameter at the outset, and 5 inches in diameter after passing the final pumping station. It being found more advantageous to locate the refineries on the seaboard and the Great Lakes, pipe lines were rapidly laid to the chief cities so situated in the northeastern part of the United States. In 1879 a through pipe line from Olean, N. Y., to the Atlantic coast at Bayonne, N. J., was opened, and by 1892 the National Transit Company alone had secured control of or built a vast mileage of trunk lines from the oil fields to the Great Lakes and the Atlantic Ocean. Besides the National Transit Company there were a dozen or so other companies in 1892, but by 1901 two companies controlled practically all the pipe line in the United States, most of the mileage belonging to the National Transit Company, which previous to the dissolution in 1911 was an integral part of the Standard Oil Company (q.v.).

At river crossings the pipe is either carried on bridges or laid on and anchored to the bed of the stream. At the Hudson River crossing a trunk line laid prior to 1893 is anchored to two sets of heavy chains, parallel to and some 25 feet from the pipe, held down by heavy weights. This line is incased in a second pipe. Across the salt marshes near New York the line is incased in concrete, to prevent corrosion. Ordinarily an 8-inch trunk line costs from \$5000 to \$6000 a mile. It is always the raw not the refined oil that is pumped, and to prevent accumulations of dirt or paraffin it is necessary frequently to force a "go-devil" or scraper with sharp blades through the line. The Texas and California fields also have their systems of pipe lines. In fact, it has been estimated that there are over 10,000 miles of trunk line and 80,000 miles of feeders in the United States.

The oils in the western part of the United

States are heavier and more viscous than the petroleum of the Appalachian region, consequently great difficulty was experienced in forcing the oil through pipe lines. Accordingly, in 1907, a rifled pipe line was introduced in California for heavy oils, with a rifling about $\frac{1}{8}$ inch deep, making one complete revolution in 10 linear feet. This was employed on a line 282 miles in length for the dense petroleum in the Kern River district, the line extending between Bakersfield and Porta Costa, on San Francisco Bay.

In the United States the provisions of the amended Interstate Commerce Act, as in force on Jan. 1, 1916, "apply to any corporation or any person or persons engaged in the transportation of oil or other commodity, except water and except natural or artificial gas, by means of pipe lines and partly by railroad, or partly by pipe lines and partly by water." The Interstate Commerce Commission has prescribed certain rules and regulations for the classification of pipe-line accounts and for the destruction of records and early instituted an investigation into the practices of the pipe-line companies. The question of the jurisdiction of the commission was raised, and the Supreme Court of the United States sustained the conclusion of the commission in large part (*United States v. Ohio Oil Company et al.*, 234 U. S. 548). See RAILWAYS, section on *Government Regulation*.

The first oil pipe line was laid in Russia in 1879 to reach a refinery at the so-called Black Town of Baku. It was 8 or 9 miles long. By 1895 there were 22 pipe lines in Russia. In July, 1900, a pipe line 143 miles long, from Mikhoilovo to Batum, was put in use. It is for refined oil only, from the Baku deposits, supplementing the railway over a section where transportation is difficult. The line later was extended to Baku, making it 550 miles in length, with a designed capacity of 400,000,000 gallons per annum.

In Mexico the Furbero oil fields were connected by a 6-inch pipe line with Tuxpan on the seacoast, 60 to 70 miles distant. This pipe line extended about $1\frac{1}{2}$ miles out into the sea, so that tank vessels lying off the shallow shore could be filled while at anchor. In Mexico the Cowdray (British) interests have some 200 miles of pipe lines. Pipe lines are found in Galicia and Rumania, also in Japan, Burma, and the Dutch East Indies. At Panama before the opening of the canal an 8-inch pipe line 51 miles in length was maintained to transport oil from tank steamers on the Pacific to similar craft on the Atlantic.

Pumps are required on the pipe lines, since these climb hills and mountains many hundred feet high. The pumps are of the high-pressure, compound, condensed type, the later ones being high-duty. (See PUMPS AND PUMPING MACHINERY.) The head under which the pumps work may vary, of course, with the topography of the country through which the line is passing, but it is largely dependent on the friction alone in long lines of small pipe.

The pipe line has had a most important economic bearing on the oil industry. It has to a large degree eliminated local storage, has been able to accommodate local producers, who are for the most part independent, and made possible the concentration of refining at a few large centres convenient for export or distribu-

tion in barrels or tank cars. Thus, at one time, the Standard Oil Company maintained direct connection through feeders and main lines from individual wells to the refineries, and to-day it is possible for oil from the Oklahoma fields to be carried to the Atlantic coast. Pipe lines naturally were largely concerned in the development of the Standard Oil Company, and through the National Transit Company, Pacific Oil and Gas Company, and Buckeye Pipe Line it maintained a network serving the United States.

Natural-Gas Pipe Lines are often similar to the wrought-iron lines described above, but they are also composed of riveted steel plates and even of cast iron. Another variation from the oil pipe lines is the size of the gas mains, 16 to 24 inches or more in diameter instead of 4 to 8 inches. It is said that the Chinese used bamboo pipes for natural gas, and that a wooden main 20 miles long was laid from a well at West Bloomfield, N. Y., to Rochester as early as 1865 or thereabouts. In 1872 gas was piped to Titusville, Pa., through a 2-inch and a $3\frac{1}{4}$ -inch iron pipe line, $5\frac{1}{2}$ miles long. In 1876 a 6-inch main, 17 miles long, was laid to Sharpsburg, Pa., from the Harvey well, in Butler County. The feeders to the pipe lines are 2 to $2\frac{1}{2}$ inches in diameter. The main lines are 40 to 50 miles in length. The pressures in various fields originally ran from 300 to 1000 pounds per square inch, but they have fallen off, year by year, until in many cases where they have not failed they are only a small fraction of the initial. This has necessitated *pumping the gas*. The first pumps were installed by the People's Company, of Pittsburgh, Pa., in 1890. Now nearly every company supplying gas to the larger cities is compelled to pump in winter. The pumping is generally effected by some standard form of air compressor, driven by compound or triple expansion steam engines, or a booster or high-pressure blowers may be used where there is a pressure of 10 to 15 pounds and the market is reasonably near by. The gas itself is generally used as fuel, but sometimes coal is used in order to husband the diminishing gas supply. Large gas engines, even of 1000 horse power, are used to operate the gas compressors. The Midway Gas Company in California has a pipe line from Kern County to Los Angeles and the coast, 117 miles long, consisting of 12-inch pipe with plain end heads joined by the Hammond coupler. The initial pressure of 450 pounds to the square inch would afford a capacity of 24,000,000 cubic feet per day. A compressor plant is located in the district served by the Midway Company.

Where natural gas reaches a city or plant under high pressure, automatic pressure reducers are employed to reduce the gas to a uniform pressure of 10 to 50 pounds before it enters the distributing mains. On each consumer's service pipe another reducing and regulating valve maintains a pressure of about one-half pound. See GAS, NATURAL; PETROLEUM; PIPE; STANDARD OIL COMPANY.

Bibliography. W. S. Tower, *The Story of Oil* (New York, 1909); Sir Boverton Redwood, *Petroleum* (3d ed., 3 vols., London, 1913); Groves and Thorp, *Chemical Technology*, vol. vi (New York, 1913); F. A. Talbot, *The Oil Conquest* (London, 1914); *The Mineral Industry* (New York, annually); *Mineral Resources of the United States* (Washington, annually). For the problems involved in the flow of oil

in pipe lines, consult E. I. Dyer, "Notes on the Flow of Oil in Pipes," in *American Society of Mechanical Engineers' Journal*, vol. xxxvi (New York, 1914). For gas pipe lines: H. P. Westcott, *Handbook of Natural Gas* (Erie, 1913); *Classification of Investment in Pipe Lines, Pipe Line Operating Revenues, and Pipe Line Operating Expenses of Carriers by Pipe Lines*, prescribed by the Interstate Commerce Commission (Washington, 1914); *Regulations to Govern the Destruction of Records of Carriers by Pipe Lines*, prescribed by the Interstate Commerce Commission (ib., 1915).

PIPE OF DESIRE, THE. An opera by Frederick S. Converse (q.v.), first produced in New York, March 18, 1910.

PIPER. A fish of the North Atlantic coast, one of the gurnards (*Trigla lyra*), which reaches three or four pounds in weight and is delicate food. See GURNARD.

PIPER, MRS. LEONORA E. (?-). An American psychic medium. She early attracted the attention of Prof. William James and of other Americans, and in 1889-90 she gave sittings in England to Sir Oliver Lodge and other members of the Society for Psychical Research. Richard Hodgson and F. W. H. Myers believed in Mrs. Piper's ability to serve as a medium for communications from the dead, through speech or automatic writing. Others considered her powers telepathic. For details consult the long reports of Prof. James H. Hyslop, and Henry Holt, *On the Cosmic Relations* (2 vols., New York, 1914). See PSYCHICAL RESEARCH, SOCIETY FOR; SPIRITUALISM.

PIPERACEÆ (Neo-Lat. nom. pl., from Lat. *piper*, pepper), THE PEPPER FAMILY. A family of about 1000 species of dicotyledonous shrubs (a few almost trees) and herbs (some climbing), natives almost exclusively of the hottest parts of the globe, particularly of Asia and America. None of them are found in cold regions. Most of the species are called pepper, but some are known also by other names, particularly those of which the fruit is not used as a spice, but of which some part is otherwise employed, as betel, cubebs, matico, and ava. Pepper (q.v.) is the most important product of the family.

PIPERAZINE, known also as DIETHYLENE-DIAMINE, ETHYLENIMINE, PIPERAZINE, and DISPERMINE. A compound ($C_4H_{10}N_2$) formed by the action of ammonia upon ethylene bromide or chloride. It is produced also by the interaction of ethylene bromide and aniline upon the addition of a solution of potassium hydroxide, forming di-phenyl-piperazine. By treatment of this with sulphuric or nitric acid and distillation with alkalis piperazine is produced. It appears as white, odorless, tasteless, deliquescent crystals, which are freely soluble in water. Its use in gout and the uric acid diathesis depends upon its property of uniting with uric acid to form a very soluble compound which is excreted in the urine instead of forming calculi in the kidney. Its use in connection with these seems to be prophylactic, as its claims to a solvent effect upon concretions already formed have been exaggerated. It must be taken largely diluted with water.

PIPERIDINE, pi-pér'i-din or -dên. See ALKALOIDS; PIPERINE.

PIPERINE (from Lat. *piper*, pepper), $C_{17}H_{25}NO_6$. A weak basic substance found in pepper. It may be obtained by boiling powdered

pepper with slaked lime, filtering, evaporating the filtrate to dryness, and extracting the piperine from the residue with ether. When crystallized from alcohol, piperine forms colorless prisms, which are insoluble in cold water, but which dissolve readily in alcohol and ether. On heating piperine with caustic potash solution it breaks up into piperic acid, $C_{12}H_{15}O_6$, and a remarkable oily base called *piperidine* (C_4H_9N). (See PYRIDINE.) Piperine is used for making heliotropin and sometimes as a substitute for pepper. See ALKALOIDS.

PIPE ROLLS. A name applied to the great or annual rolls of the English Exchequer, written for the treasurer. They are so called because of their being rolled into the shape of pipes, or on account of the favorite comparison of the public treasury to a reservoir into which every branch of revenue flowed through these pipes. They were written by the treasurer's scribe and controlled by the Chancellor's scribe. They contained a statement of the King's revenue, drawn up by the sheriff of one or more shires, and an account of the expenditures made by the sheriff in his office. The chief item of the revenue was the "ferm" of the shire, which consisted of the King's income from the royal demesne, the yearly fines paid by the boroughs for their corporate privileges, and the fines decreed in the county courts. Another item was the Danegeld, tax levied to resist the Northmen.

The oldest extant pipe roll is that of 31 Henry I (1131). These rolls extend from the second year of Henry II (1156) till 1833, when the ancient system of the Exchequer was abolished, with but two breaks of a single year, and are among the most valuable of records preserved in the Public Record Office. In 1883 the Pipe Roll Society was founded, with the intention of publishing all the pipe rolls. Its publications (34 vols., London, 1884-1913) include the 5-24 Henry II, forming a combination with the publications of the Record Commission. The latter had in 1833 published the pipe roll of 31 Henry I and the Chancellor's roll of 3 John, and in 1844 the pipe rolls 2, 3, 4 Henry II and 1 Richard I. Consult Pipe Roll Society, *Publications* (London, 1884 et seq.).

PIPE/STONE. A city and the county seat of Pipestone Co., Minn., 198 miles west-southwest of Minneapolis, on the Great Northern, the Rock Island, the Chicago, Milwaukee, and St. Paul, and the Chicago and Northwestern railroads (Map: Minnesota, A 7). It is the principal commercial and shipping centre of the grain district of southwest Minnesota and has a large creamery and several wholesale houses. In this neighborhood was quarried the sacred pipestone of the Indians. In the city are a government training school for Indians and a Carnegie library. Pipestone was settled in 1878 and became a city in 1901. Pop., 1900, 2536; 1910, 2475.

PIPE VINE. See ARISTOLOCHIA.

PIPI, pè'pè (Brazilian name). The ripe pods of *Cesalpinia pappi*, used in tanning and not infrequently exported with divi-divi (q.v.). See CESALPINIA.

PIPING CROW, or CROW SHRIKE. One of the Australian shrikes of the genus *Gymnorhina*, large, black and white, insect-eating, showy birds, with loud, piping voices, mentioned in such local names as organ bird (*Gymnorhina hyperleuca*) of Tasmania and flute bird. The latter (*Gym-*

norhina tibicen) is very common throughout Australia. Compare ORGAN BIRD.

PIPISTRELLE, pip'is-trél'. See BAT.

PIPTT, or PIPIT LARK. See TITLARK.

PIPPA PASSES. A dramatic poem by Robert Browning (1841). Pippa, a girl from the silk mills at Asolo, on a holiday passes several groups of people at a critical moment in the lives of all, and by snatches of her song, which they overhear, changes the fate of each and in one case changes her own.

PIPPI, pip'pé, GIULIO, commonly called GIULIO ROMANO (1492-1546). An Italian painter, decorator, and architect, born in Rome. He was the chief follower of Raphael, whose school he entered early. Raphael, who left all his property to Giulio and Penni, another pupil, had chiefly relied on the former for the execution of his designs; Giulio assisted in the Stanza del Incendio, the Loggie of the Vatican, and in the Villa Farnesina. (See RAPHAEL.) He was also employed to paint easel pictures in Raphael's studio, especially such as were intended for foreign patrons, like the large Madonna in the Louvre and the so-called "Pearl" at Madrid. After Raphael's death he assisted in the Sala di Costantino in the Vatican, himself painting the chief composition, the battle picture; finished, together with Penni, the "Coronation of the Virgin," in the Vatican Gallery; and himself painted, in an admirable manner, the lower part of Raphael's "Transfiguration."

After Raphael's death Giulio was the acknowledged head of the school. Unfortunately his architectural works at Rome have been either spoiled by restoration or left incomplete, but we know that he designed and decorated for Cardinal Medici Villa Madama and Villa Lante. The best of his easel pictures are, perhaps, the "Madonna with the Cat," in the Naples Museum; "Apollo and the Muses," Pitti Palace (Florence); and the masterpiece of his early period, "The Stoning of St. Stephen," the altarpiece of Santo Stefano, Genoa. Other examples, both religious and mythological, are in Rome, the Uffizi (Florence), the galleries of Vienna, Dresden, the National Gallery (London), and especially in the Louvre, which is rich in his works. Compared with Raphael, his independent works show absence of religious feeling and lack of grace. The forms are often coarse, though the drawing is good, and the color is marred by the use of deep black shadows and a dull brick red. His work, on the whole, shows a greater influence of Michelangelo than of Raphael.

In 1524 Giulio went to Mantua at the call of Duke Federigo Gonzaga, who placed him at the head of all his artistic undertakings and raised him to the nobility. Here he developed a remarkable architectural activity, rebuilding whole quarters of the city. He built the ducal palace (1535-40), which was decorated after his designs, prominent among which were a series of frescoes of the Trojan War. Among his other architectural works were the great church of San Benedetto, 10 miles south of Mantua; the interior of the cathedral of Mantua; his own tasteful house (1544), built around a simple court and ornamented with a fine rustica façade; and the greatest of all his achievements, the Palazzo del Tè, just outside the city walls. Though enlarged from a stable for the Duke's stud, this palace is the best-preserved example of a princely villa of the golden age of Italian art. It is a one-story rustica building, in the Doric style.

The entire interior is decorated with stucco and frescoes, after Giulio's designs, by his pupils. The great hall has realistic portraits of the Duke's favorite horses, which are epoch-making in animal painting. Most beautiful of all the decorations are those of the second hall, representing the "Story of Psyche." Two of the original drawings for this cycle, preserved in the Villa Albani, are perhaps his most charming work. Of the remaining rooms the most famous is that in which the "Fall of the Giants" through Jupiter's thunderbolts is represented in a very realistic manner. The scenes are not divided by frames or paneling, and the spectator stands in the midst of the catastrophe, which is so realistically represented as to create the impression that the walls are falling in with the giants.

The chief characteristics of Giulio's Mantuan work are profound antiquarian knowledge and a pronounced tendency towards realism. The action is exaggerated and mannered, and in such frescoes as the "Fall of the Giants," which greatly influenced contemporary painters, it is already Barocco. Of his later religious works the most remarkable are the designs for frescoes in Sant' Andrea, Mantua, and for Torbido's paintings in the cathedral of Verona. Of his later easel paintings the "Adoration of the Kings," in the Louvre, and the "Madonna della Catina" (Dresden), in which the Christ child is naively represented as being bathed, were executed by his own hand. Pippi was also at the head of all the Duke's engineering undertakings, and in draining the marshes about Mantua he contracted a fever, from which he died at Mantua, Nov. 1, 1546, just as he was about to return to Rome to accept an appointment as architect in chief of St. Peter's. Consult C. K. D'Arco, *Istoria della vita et delle opere di Giulio Pippi* (Mantua, 1838), and A. Dollmayr, in *Jahrbuch der kunsthistorischen Sammlung des allerhochsten Kaiserhauses*, vol. xxii, part 1 (Vienna, 1901). See Plate of TAPESTRIES.

PIPPIN. See PEPIN.

PIPPUL, or PIPUL. See PEEPUL.

PIPPRA, pí'prá (Neo-Lat., from Gk. *πιπρά*, variant form for *πιπρῶ*, *pipró*, woodpecker, otherwise explained as of possible South American origin). One of a group of nonoscine, passerine birds composing the family Pipridae, many of which are also known as ant birds and as manakins (q.v.). They are chiefly South American, but a few species extend north into Central America and Mexico. They are small birds, resemble titmice in their habits, and seek their food in low bushes and near the ground. The males are gorgeously colored with glossy black, scarlet, yellow, and sky blue, the females are of a dull greenish hue, or of some other inconspicuous color. They are thickset birds, usually with short square tails and short broad bills, the upper mandible hooked and notched at the tip. The true manakins (*Manacus*) have the chin feathers elongated like a beard. Pippas are most nearly related to the cotingas and American flycatchers (q.v.). See Plate of COTINGAS.

PIPSISSEWA. A small evergreen plant. See WINTERGREEN.

PIQUA, plk'wá. A city in Miami Co., Ohio, 72 miles west-northwest of Columbus, on the Miami River and the Miami and Erie Canal and at the junction of the Cincinnati, Hamilton, and Dayton, the Pittsburgh, Cincinnati, Chicago, and St. Louis, and the Western Ohio railroads (Map: Ohio, B 5). It has the Schmidlapp Free School

Library, a Federal building, and the Ball Memorial Hospital. Piqua is an important industrial centre, with large sheet-steel mills, ironworks, stove and range works, strawboard mills, furniture factories, woolen mills, underwear mills, handle, pole, and shaft works, etc. Good water power is afforded by the river. Piqua is governed by a mayor, elected every two years, and a unicameral council, and owns and operates its waterworks. Pop., 1900, 12,172; 1910, 13,388; 1915 (U. S. est.), 14,029.

PIQUE DAME, pèk'dám'. An opera by Tschalkowsky (q.v.), first produced at St. Petersburg (Petrograd), Dec 19, 1890; in the United States, March 5, 1910 (New York).

PIQUET, pé'ká' (Fr., picket, peg). A game of cards, of great antiquity and considerable scientific possibilities. Its laws, as published in Hoyle's *Short Treatise on the Game of Piquet* in 1744, remained in force until the adoption of the rules of the Portland Club in 1873. It is played by two persons with a pack of 32 cards, the sixes, fives, fours, threes, and twos being discarded. In the cut for deal, the lowest takes the deal. Ace is highest and counts 11, the other cards ranking as in whist. After cutting, the dealer gives the two top cards to his adversary, then two to himself, and so on until each has 12 cards. If the hand of either player contains no face card it is called *carte blanche* (white card), and he scores 10 at once. The "elder hand" (the nondealer) must discard one of his cards and take another from stock, but he may discard as many as five and take a like quantity. The younger hand must discard one also and may discard three. The players then announce the combinations of their cards, and each replies according to whether he has, or has not, an equal or greater number, "good," "equal," or "not good," and scores "the point" according to the number of points the rules apportion to his combination. The play then proceeds, the leader of a counting card (ace, king, queen, knave, or ten) counting one for each card led, whether he wins the trick or not, and the winner of each trick leading for the next, as in most card games. The younger hand must, if possible, follow suit. If the leader wins the trick the opponent counts nothing, but if he wins the trick he counts one. The winner of the last trick counts two. If one player wins more than half the tricks he adds 10 to his count; if he wins all he adds 40. The variations of scoring and play for *carte blanche*, or a hand of only plain cards, *point*, the strongest suit, *sequence*, *quatorze*, *trio*, *pique* and *repique*, are too intricate to be described except by the laws of the game. Consult. Cady, *Piquet* (New York, 1896); "Cavendish," *The Laws of Piquet, with a Treatise on the Game* (London, 1882); "Aquarius," *Piquet and Crabbage* (ib., 1883).

PIRACICABA, pé'râ-sê-kâ'bâ. A town of the State of São Paulo, Brazil, on the left bank of the Piracicaba River, 273 miles west of Rio de Janeiro, and on Sorocabana Railway (Map Brazil, H 8). The town carries on a brisk trade in coffee and sugar and utilizes the water power of the river for milling purposes. Pop. (est.), 5000.

PIRACY (ML. *piratia*, from Lat. *piratica*, piracy, fem. sing. of *piraticus*, from Gk. *πειρατικός*, *peiratikos*, relating to a pirate, from Gk. *πειράτης*, *peiratēs*, pirate, one who attacks or tries, from *πειράω*, *peirao*, to attempt, attack, from *πειρα*, *peira*, attempt, attack; connected with *πόρος*, *poros*, passage, Skt. *par*, to cross,

and ultimately with Eng. *fare*). In the popular sense, the capture or destruction of a ship on the high seas by violence committed by persons not acting under national authority.

In Law. The crime of robbery on the high seas. In general, piracy is punishable by any member of the family of nations, whether the act was committed by or against its own subjects or citizens or not. The penalty is death. But piracy *jure gentium*, or piracy as defined by international law, and piracy as described by the municipal law of a particular state, must be distinguished.

International Law. Three requirements are necessary to constitute an act of piracy *jure gentium*: first, it must be an act of adequate violence, though it need not be necessarily an act of depredation. While the pirate is generally merely a robber, acts done by unauthorized persons for political ends have been deemed piratical, though the *animus furandi*, the intent to rob, was wanting. A single act of violence may be sufficient, as the successful revolt of a ship's crew against its officers. If they gain control of the ship, they are pirates; if their attempt fails and lawful authority is not in fact superseded, the act is one of mutiny only, not piracy. Second, it must be an act done outside the territorial jurisdiction of a civilized state. Some authorities have held that an invasion from the sea upon the coast of a civilized state to ravage and destroy without national authorization is piracy. But being done within the territorial jurisdiction of the state, it is subject to the municipal law thereof and is outside the jurisdiction of the international code. Yet an act of similar character against an unappropriated island and the robbing of civilized persons there engaged in trade or missionary work would be piracy. Third, the perpetrators of the act must be without the authority of any recognized political community. Acts which when done under national authorization are lawful acts of war are, hence, piracy when not so authorized, and the possession of two or more incompatible commissions is deemed to have the same effect as the absence of any. So if in time of war a privateer procures letters from each belligerent and preys upon the commerce of both, she is a pirate; but if a cruiser having a lawful commission exceeds her authority in making captures, she is not a pirate, for the state under whose authority she operates is held responsible for her acts. For this reason the acts of a cruiser or submarine in sinking enemy merchant ships with all on board or even in sinking neutral vessels, however repugnant such acts may be to international law or humanity, cannot properly be described as acts of piracy. Whether directly authorized or not by the state whose commission the attacking vessel bears, the acts are the acts of the state in question, and a civilized state cannot be guilty of piracy. For purposes of authorization recognition of independence is not required; but recognition of belligerency is sufficient to validate a commission authorizing acts of violence for belligerent cruisers; but if such a community ceases to exist as a political unit, the commission is no longer valid.

Attempts have been made to bring acts done by vessels under commissions from a revolted community, which has not obtained recognition of belligerency, under the protection of this rule. Several instances have occurred where a disposition has been shown to treat as pirates persons

accepting letters of marque and reprisal from one of two belligerents when the other was at peace with the nation of which the privateer was a subject, but such an attitude is at variance with the general usage of nations.

Municipal Law. One of the attributes of an independent state is the power to regulate its own criminal code, and it may declare offenses to be piracy which are not so regarded by international law. These laws can have binding force only in the jurisdiction creating them; and while similar regulations may be adopted by other states, in the absence of special agreement between them the officers of one may not arrest or punish subjects of the other for offenses committed beyond its jurisdiction, even though such acts are defined as offenses by the laws of the state to which the offender belongs. Thus, while the slave trade is declared to be piracy only by virtue of municipal law, efforts have been made to bring it under international jurisdiction by agreement between the Powers. This has not been effectually done, although after much international difficulty and dispute as to the right of search, etc., an international convention was finally reached in 1890 as a result of the conference of the civilized states, called at the instance of the King of Belgium, which provided for a complicated system of measures of repression.

See MARQUE, LETTERS OF; MUTINY; PRIVATEERING; SLAVERY. Consult the authorities referred to under INTERNATIONAL LAW.

PIRÆUS (Lat., from Gk. Πειραιεύς, *Peiraiæus*, Πειραιεύς, *Peiraiæus*). The port of Athens situated on a rocky peninsula about 5 miles southwest of the city (Map: Greece, E 6 and A 8). The nearest point in the shore line to Athens is the long sandy beach of Phalerum, bounded on the east by Cape Colias and on the west by a rocky peninsula, with two principal summits—one, Munychia, at the northeast, close to the bay of Phalerum; the other, Acte, at the southern end of the cape. In this promontory are three harbors. The smallest is on the east side of Munychia; the next in size is southwest of Munychia and northeast of Acte; the third and largest is on the west side of the peninsula, north of Acte, and is a large basin with two smaller bays at each side, almost landlocked between Acte and a tongue of land projecting from Eëtionea, on the Attic coast. This harbor is supplied with modern docks, and a portion of it is used by the Greek navy. Over one-half of the foreign commerce of Greece passes through Piræus, which is also a considerable manufacturing centre, producing mainly textiles, brandy, leather, paper, and macaroni. The population in 1909, according to Baedeker, was 74,580, making Piræus the second largest city of Greece. The earliest port of Athens was Phalerum, and the advantages of the Piræus were first observed by Themistocles (493-492), who began to fortify it. It was not till after the Persian wars that the peninsula was surrounded with lofty and strong walls, the mouths of the harbors narrowed by moles so that they could be easily closed by chains, and the whole connected with the city by the Long Walls (q.v.). The city was laid out by the famous architect Hippodamus of Miletus, probably in the time of Pericles, in a regular system of broad straight streets crossing one another at right angles and broken by frequent open squares. Wharves, warehouses, and porticoes were built along the harbor side, and a merchants' exchange was provided for the display of samples. The

great harbor was the scene of mercantile activity. The smaller harbors were reserved for the Athenian navy; the remains of the ship houses in which the triremes or war vessels were hauled up can still be traced. With the decline and ruin of Athens during the Middle Ages, the Piræus naturally was abandoned, and the present city has been built since Athens became the capital of Greece. According to the accepted nomenclature, the smallest harbor, now Fanari, is the ancient Munychia; the next, now Pashalimani, is Zea; the great harbor was known as Cantharus. Recently, however, strong reasons have been advanced for identifying Phalerum with Fanari, Munychia with Pashalimani, and Zea and Cantharus with the bays on either side of the great harbor.

Bibliography. C. Wachsmuth, *Die Stadt Athen im Altertum* (Leipzig, 1874, 1890); Milchhöfer, "Peiraiæus," in A. Baumeister, *Denkmäler des klassischen Altertums* (Munich, 1889); a Greek pamphlet by Angelopoulos, *Περὶ Πειραιῶς, καὶ τῶν λιμένων αὐτοῦ, Ὁν Πειραιῶς and its Harbors* (Athens, 1898); W. Judeich, *Topographie von Athen* (Munich, 1905); E. A. Gardner, *Ancient Athens* (New York, 1907); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); C. H. Weller, *Athens and its Monuments* (New York, 1913).

PIRANESI, pē'rā-nā'zē, GIOVANNI BATTISTA (GIAMBATTISTA) (1720-78). An Italian architectural and decorative artist and engraver. His copperplate records of the monuments of ancient and contemporary Italy, remarkable for boldness of conception and brilliancy of execution, were a source book for the Louis XVI, Adam, and Empire styles. Piranesi was born at Mojano, near Venice, Oct. 4, 1720, the son of a stonemason. He first studied architecture with his uncle; a knowledge of perspective he gained from the writings of Vitruvius and under Carlo Zucchi. His brother Angelo, a Carthusian monk with an exhaustive knowledge of the classics, inspired him with enthusiasm for the ancient masterpieces. From 1740 to 1743, while at Rome as draftsman to the Venetian embassy, Piranesi studied architecture and antiquities and worked in the studio of the theatre decorators Giuseppe and Domenico Valeriani, taking up engraving towards the end of this period. Felice Polanzani, who was chiefly responsible for his training, was teacher of engraving at Rome in the Ospizio di S. Michele. In 1743 he published his first book, the *Prospettive* (13 plates). Returning from a visit to Venice, where it is said that he studied painting with Tiepolo (q.v.), Piranesi published four rococo *Grotesche* plates and the 14 famous *Carceri* plates, all of which show Venetian influence. In Rome he made a success of selling prints on commission, and before long he was able to undertake his task of illustrating the buildings of ancient and modern Rome in a monumental manner. An idea of the magnitude of his accomplishment may be gained from study of the huge engraved *Plan of Rome and the Campus Martius* (c.1774), with an index to all the buildings, and with reference to plates in *Antichità Romane*, *Vedute di Roma*, *Campus Martius*, *Magnificenza*. Especial interest attaches to the *Campus Martius* because its publication in 1762 was greatly encouraged by Piranesi's warm friend, the English architect and furniture designer, Robert Adam, to whom the volume is dedicated and who made free use of the prints in his own architectural work. Pira-

nesi was knighted by Pope Clement XIII. He died Nov. 9, 1778.

The total number of copperplates engraved by Piranesi, the majority folio or double-folio in size, is about 1000, exclusive of small text illustrations and vignettes. Most of these plates were published during his lifetime, between the years 1743 and 1778. After his death many plates by his son, Francesco Piranesi, and other engravers were added to the collection and appear in nearly all the approximately *Complete Editions of Piranesi*. Many of these additional plates were engraved and first published in Paris, after Francesco and his brother settled there in 1798. In 1835-39 was published the *Dido Edition of the Works of Piranesi*, the plates of which were acquired by the Royal Calcografia in Rome, excellent reprints still being made from many of them. Among the greatest of Piranesi's plates are his views of St. Peter's, exterior and interior, Column of Trajan, Fountain of Trevi, Golden House of Nero, Colosseum, Mausoleum of Hadrian (Castel Sant' Angelo), Arch of Titus, Pantheon, Lake Albano, Castel Gandolfo, and especially Pæstum. There are sets of his works in New York in the Public Library (2), the Avery Library of Columbia University, the libraries of the Metropolitan Museum of Art, and the Architectural League, and in several American private collections. A complete descriptive list of his plates and of the form in which they were originally published is given by Giesecke (revised by Hind and later by Hunter).

Bibliography. Russell Sturgis, *Etchings of Piranesi* (New York, 1900); Albert Giesecke, *Studien über Giovanni Battista Piranesi* (Leipzig, 1911); Arthur Samuel, *Piranesi: His Life and Works* (New York, 1911); B. B. Moore, in *Prints and their Makers* (ib., 1912); A. M. Hind, in the *Burlington Magazine*, vol. 248 (London, 1913-14); G. L. Hunter, in the *American Architect*, vol. 107 (New York, 1915). See INTERIOR DECORATION, *Adam Period*; PERCIER, CHARLES; FURNITURE.

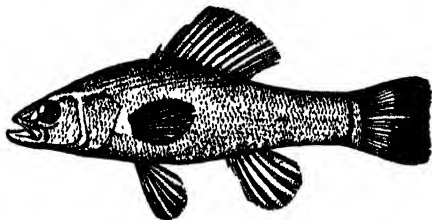
PIRANO, pĕ-ră'nô. A seaport and episcopal city of the Crownland of Istria, Austria, on a peninsula in the Bay of Largone, 13 miles southwest of Trieste (Map: Austria, C 4). It contains an old castle, has a deep harbor and several dockyards, and is the seat of considerable commerce. Wine, oil, glass, soap, and chemical products are manufactured. The salt works of Pirano are among the most productive in Austria. Pop., 1910, 15,320, mostly Italians.

PIRATE, THE. A novel by Sir Walter Scott (1822).

PIRATE BUG. A bug of the family Reduviidæ, a large group comprising more than 2000 species, all of which are predatory in habits and feed upon other insects; also known as assassin bugs and cannibal bugs. With many species the beak is so strong that it is capable of piercing the skin of human beings. (See CONE-NOSE.) A notable example is the wheel bug (*Arilus cristatus*), called by the negroes in the South "The Devil's riding horse." The eggs, which look like miniature leather bottles standing on end and in hexagonal clusters, are attached to the bark of trees and hibernate. The young bug emerges by pushing off the cap of the bottle. It has a blood-red abdomen and in walking frequently elevates the hind end of the body, curling it forward. It feeds upon soft-bodied insects, such as plant lice, but, as it grows, attacks larger insects and when full grown will destroy big

caterpillars and even beetles. The full-grown bug is black and captures its prey by stealth. Its coloration is protective. In the more southern States it is an important factor in the destruction of numerous caterpillars which defoliate fruit and shade trees. Consult: V. L. Kellogg, *American Insects* (New York, 1908); J. H. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, 1909); L. O. Howard, *Insect Book* (New York, 1914).

PIRATE PERCH (so called from its voracity). A strange little fish of sluggish streams along the eastern coast of the United States and in the Mississippi valley, which is related to the perches, but has been set apart in a suborder,



PIRATE PERCH.

Xenarchi. The single species (*Aphredoderus sayanus*) represents the only genus and family of this group, which appears to be a relic of an ancient type. Its color is dark olive, profusely speckled with darker points, which often make blackish streaks along the rows of the scales; two blackish bars cross the base of the tail; and the length is about 5 inches.

PIRATES OF PENZANCE, THE. A comic opera, words by Sir William S. Gilbert and music by Sir Arthur Sullivan (q.v.), first produced in New York, Dec. 31, 1879; in England, April 3, 1880 (London).

PIRAYA, pĕ-ră'yă, or **PIRAI**, pĕ-rĭ'. A South American fish. See CARIBE.

PIRENE, pĭ-rĕ'nĕ. A spring at Corinth, sacred to the Muses. Various accounts are given of its origin, but the usual tradition declares that it was struck out of the Acrocorinthus by the winged horse Pegasus, who was captured by Bellerophon while drinking its waters.

PIRENEOS, LOS, lōs pĕ'ră-nă'ōs (Sp., The Pyrenees). An operatic trilogy by Pedrell (q.v.). Its first performance was at Barcelona, Jan. 4, 1902.

PIRITHOUS, pĭ-rĭth'ô-ŭs. In Greek legend, King of the Lapithæ (q.v.) and son of Ixion, or of Zeus. At his marriage with Hippodamia the centaur Eurytus carried off the bride. In the fight that resulted between the Lapithæ and the Centaurs, Pirithous was aided by his friend Theseus (q.v.), King of Athens, and subsequently, with his help, attempted to carry off Persephone (see PLUTO) from the lower world. For this both were bound to a rock by Pluto, but Theseus was released by Hercules, while Pirithous was left to his punishment. Consult Horace, *Odes*, iii, 4, 80; iv, 7, 27-28.

PIRKHEIMER, pĭrk'hĭ-mĕr, WILFALD (1470-1530). A German humanist. He was born at Eichstätt, was educated at Padua and Pavia, and after settling in Nuremberg (1497) was counselor to the Emperor Maximilian for many years. He did much for the schools of Nuremberg. In 1526 he became counselor to Charles V, but soon gave himself up entirely to scholarly studies. At the beginning of the

Reformation Pirkheimer aided with Reuchlin and finally took much the same position as Erasmus, with whom, as well as with Reuchlin, Celtes, Hutten, and especially Dürer, he was on intimate terms. He wrote on mathematics, astrology, theology, and politics; also *Historia belli Sutsensis*, dealing with the war in Switzerland in 1499, in which he had commanded the forces of Nuremberg (edited, with an autobiography, by Rück, Munich, 1895), and various translations from Greek into Latin. Consult: Hagen, *Wilibald Pirkheimer in seinem Verhältnis zum Humanismus und zur Reformation* (Nuremberg, 1882); Otto Markwart, *W. Pirkheimer als Geschichtsschreiber* (Zurich, 1886); F. Roth, *Wilibald Pirkheimer* (Halle, 1887).

PIRMASENS, pîr'mâ-zên's'. A town in the Rhine Palatinate, Bavaria, situated about 30 miles southwest of Speyer (Map: Germany, B 4). It has a Protestant church with a fine monument to Landgrave Louis IX of Hesse. Its chief industry is the manufacturing of footwear, which is carried on on a large scale. Pirmasens is noted as the scene of a victory of the Prussians over the French, under Moreau, in 1793. Pop., 1900, 30,194; 1910, 38,463, chiefly Protestants.

PIRNA, pîr'nâ. A town in the Kingdom of Saxony, Germany, situated on the left bank of the Elbe, about 11 miles by rail southeast of Dresden (Map: Germany, E 3). It has a number of churches dating from the thirteenth century, an old castle with an insane asylum, a Realschule, a seminary for teachers, a school of navigation, and a municipal museum. The manufactures include leather, essential oils, enameled ware, pottery, various kinds of glass, etc. Pirna is first mentioned as a possession of the bishops of Meissen in the tenth century. It attained considerable prosperity in the Middle Ages, but subsequently declined on account of the ravages of war. During the Seven Years' War the Saxons intrenched themselves in Pirna and were forced to capitulate to a superior force of Prussians on Oct. 17, 1756. Pop., 1900, 18,295; 1910, 21,035.

PIRO, pî'rô. The name of two Indian tribes—one of North America, the other of the southern continent. 1. Piro, a Pueblo tribe of Taínoan stock, formerly occupying several villages on the plateau east of Albuquerque and along the Rio Grande near Socorro. Their most famous village was Tabira, confused by the Spaniards with the mythical Gran Quivira. Most of the villages were destroyed by the Apaches before 1680. The tribe is now extinct, excepting a nearly Mexicanized remnant at Senecu, Mexico. 2. Piro, Chuntaquiru, or Simirinche, a southern tribe of Arawakan stock (q.v.) occupying the headwaters of the Apurimac and Ucayali rivers, Central Peru. They were in part converted by the Jesuits between 1683 and 1727. They get the name of Chuntaquiru (palm tooth) from their custom of dyeing their teeth black with the root of the chunta palm. They are expert boatmen and fishermen and collect sarsaparilla and make manati oil for the traders. They dress in black cotton cloth.

PIROGUE, pî-rôg', or **PERIAGUA**, pîr-i-âg'wâ. (Fr. *progue*, from Sp. *piragua*, canoe, from the West Indian name). A form of boat used on the Western rivers of the United States and in the West Indies and Central and South America. It is usually a dugout and is made from a single log. But larger varieties are made from dugouts by splitting them in two and inserting one or more planks in the bottom to give greater

width. When fitted with sails these boats usually have two masts, which may be easily unstepped and taken down.

PIRON, pî-rôn', ALEXIS (1689-1773). A French poet and dramatist, famed for wit and epigram. He was born in Dijon, studied law, and in 1719 went to Paris as secretary to Belle-Isle, grandson of Fouquet. With Piron's monologue in three acts, called *Arlequin Deuotion*, the comic opera acquired new life. *La métromanie* (1738) also has some dramatic merit. Piron's Works are in seven volumes (1776). The epigrams, often reprinted, possess the greater significance. Piron died in Paris.

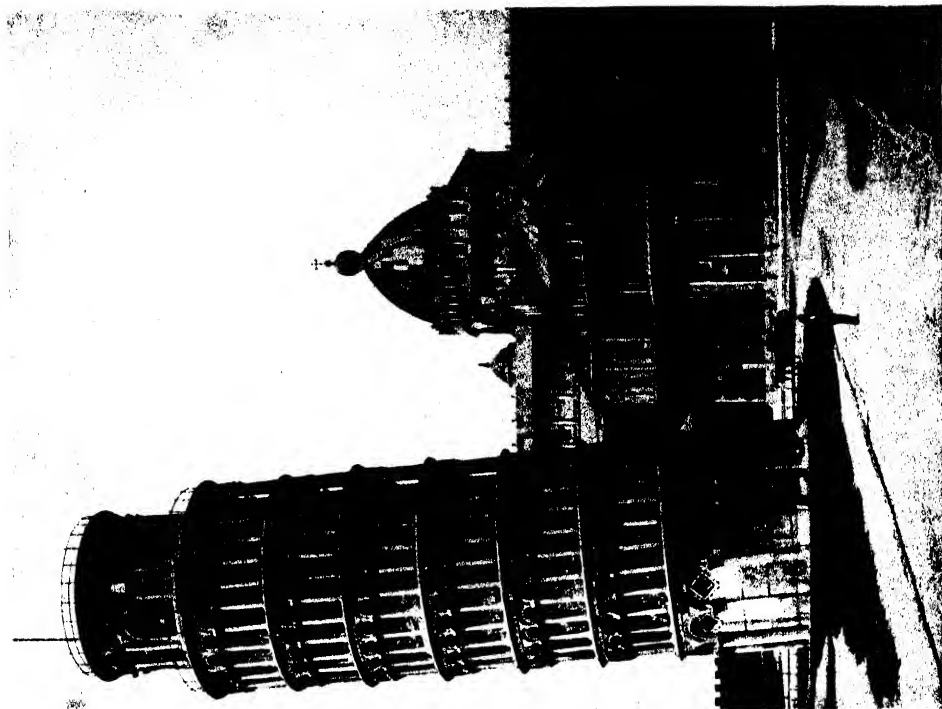
PIROT, pî-rôt'. A town of Serbia, situated near the Bulgarian frontier on the railroad from Belgrade to Sofia and 48 miles northwest of the latter city (Map: Balkan Peninsula, D 3). It is a fortified place of considerable strategic importance, and is noted for the manufacture of carpets. Pop., 1911, 10,737. In the great war which broke out in 1914, Pirot was captured by the Teutonic allies. See WAR IN EUROPE.

PIRQUET, pîr'ká, CLEMENS, BARON VON (1874-). An Austrian pediatricist. Born at Hirschstetten, near Vienna, he graduated M.D. from the University of Graz in 1900. Joining the faculty of the University of Vienna as lecturer in 1902, he was later professor of pediatrics at Johns Hopkins, at Breslau, and from 1911 at Vienna. Von Pirquet discovered the diagnostic value of tuberculin as a cutaneous reaction (1907). His writings include: *Die Serumkrankheit* (1905), with B. Schick; *Allergie* (1910); *Das Bild der Masern auf der äusseren Haut* (1913). To Nothnagel's *Spezielle Pathologie und Therapie* (1911) he contributed the article "Masern."

PIRRIE, pîr'î, WILLIAM JAMES, first BARON (1847-). An Irish shipbuilder, born in Quebec of Scotch-Irish parents. At Glasgow he studied for a time in the Royal Academical Institution. When he was 15 he became a draftsman apprentice in the (then small) shipyard of Harland and Wolff at Belfast. In 1874, when he was only 27, he was offered a partnership in this concern, of which he later became chairman. The firm built many of the larger British liners, from the *Teutonic* (1889) and *Oceanic* (1899) to the *Olympic* and *Titanic* in 1910. Pirrie was Lord Mayor of Belfast in 1896 and 1897 and high sheriff of County Antrim in 1898 and of County Down in 1899. In 1904 he left the Unionist for the Liberal party. Two years later he received a barony, in 1907 the post of controller of the Lord Lieutenant's household, and in 1909 membership in the Order of St. Patrick. He had become a prominent advocate of Home Rule. In 1910 he was appointed a member of the Road Board created under the Development and Road Improvement Act of 1909.

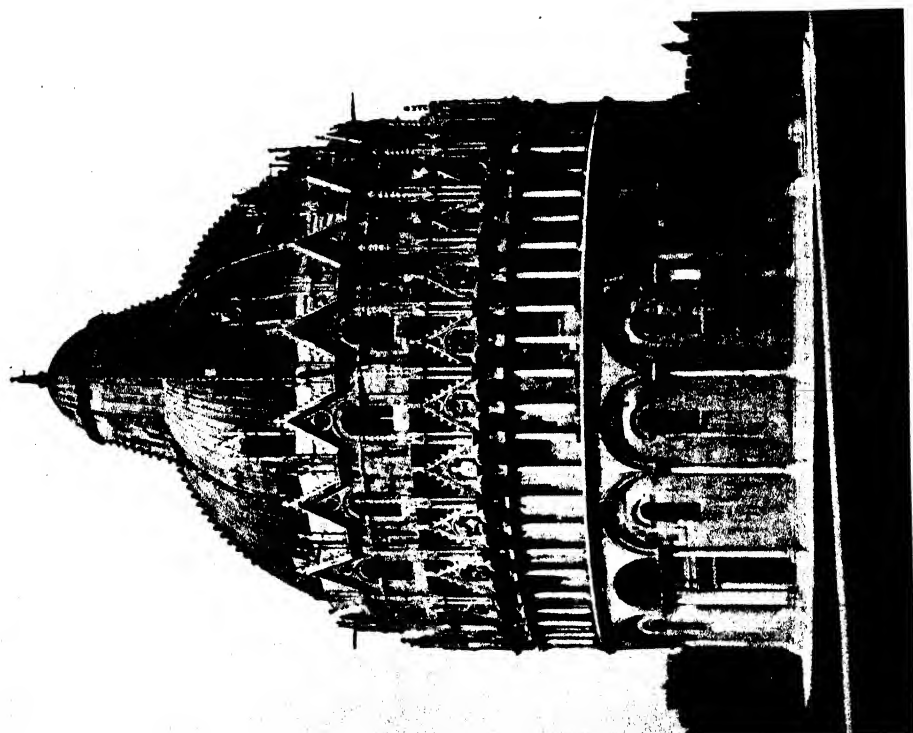
PISA, pî'zâ. The capital of the Province of Pisa in Tuscany, Italy, situated on both banks of the Arno, 6 miles from the Mediterranean, 11 miles northeast of Leghorn, and 49 miles west of Florence (Map: Italy, C 3). The climate is equable. The neighboring mountains (the Monti Pisani, 5 miles to the east) and the high ancient fortifications (over 6 miles in circuit) protect the city from winds.

The city is defended by a citadel on the southwest. Its streets are quite regular and are well paved. The centre of life in Pisa, which is a quiet town, is the Lungarno—stretches of fine wide quays bordering both banks of the river



PISA

THE CAMPANILE (LEANING TOWER) AND CATHEDRAL (EAST END)



THE BAPTISTERY

from one end of the municipality to the other. Here are fine hotels and restaurants. The Arno is spanned by five bridges.

The glory of Pisa is the far-famed Piazza del Duomo with its cathedral, baptistery, leaning tower, and Campo Santo, all situated in the extreme northwest corner of the city. The splendid cathedral, or basilica, was built after plans of Rinaldo and Boschetto between 1063 and 1118 and the ceiling and dome were restored in 1597-1604, after a fire. It is a remarkably perfect example of the Tuscan-Romanesque. It is of white marble, varied with black and red stripes. It is crowned by an elliptical dome over the crossing. Over the apse is a semidome which contains mosaics on gold ground by Cimabue and others. The façade, with its four ranges of superposed arcades and its three noble portals, rivals any in Italy. Many singular irregularities in the lines of this edifice have given rise to much controversy. The researches of Good-year have led to an increasing conviction that these were intentional deviations and not accidental. (See *REFINEMENTS OF ARCHITECTURE*.) In the interior are 68 antique columns taken by the Pisans in their wars with their enemies. Among the interesting contents is a handsome bronze lamp suspended in the nave, the swaying of which is said to have suggested to Galileo the isochronism of the pendulum. The circular marble baptistery (1153-1278), adorned with numerous columns, stands in front of the cathedral. Its dome rises to a height of nearly 200 feet, and possesses a remarkable echo. The baptistery contains a madonna by Giovanni Pisano, and a pulpit, a celebrated masterpiece, by Nicola Pisano. The beautiful marble campanile, or leaning tower (qv), rises in the rear of the church. The view from the top, reached by nearly 300 steps, is superb, embracing the Carrara and Apuan mountains, the city, and the blue sea.

Northwest of the cathedral is the quadrangular Campo Santo (cemetery). It was laid out in the beginning of the twelfth century. Its soil was brought in ships from Mount Calvary, that the dead here might lie in truly consecrated ground. A decorative Tuscan-Gothic structure (1278-83), planned by Giovanni Pisano, incloses the cemetery. Within it are interesting and suggestive frescoes by late mediæval Tuscan artists. Of these paintings the most remarkable is the "Triumph of Death." There is also a notable "Last Judgment." The monuments, sarcophagi, tablets, etc., in the cemetery proper are of exceptional interest. The Basilica San Paolo a Ripa d'Arno, founded by Charlemagne, but belonging in its present form probably to the thirteenth century, possesses a rich façade of yellow, gray, and black marble. Santa Maria della Spina (founded 1230, restored 1872) is a beautiful little church in the Italian Gothic style. There are several other interesting Gothic and Renaissance churches.

Among the palaces the attractive brick Gothic Agostini of the fifteenth century deserves mention, as does also the Toscanelli, where Lord Byron sojourned in 1822. In the Loggia de' Banchi is the present corn exchange. Near by is the Palazzo del Comune, containing the valuable Pisan archives. The university, founded in 1338, is in a huge building dating from the latter part of the fifteenth century. (See *PISA, UNIVERSITY OF*.) The municipal museum (founded in 1893) contains works by Tuscan

masters, but nothing of great interest. The Palazzo Conventuale dei Cavalieri is at present a high normal school. The Academy of Fine Arts was founded by Napoleon in 1812. Pisa has statues of the Grand Duke Leopold I, Garibaldi, Mazzini, and Grand Duke Cosimo I, by Giovanni da Bologna, near which last once stood the historic Tower of Hunger of horrible memory, described by Dante in the *Inferno*. (See *GHERARDESCA*.) The house where Galileo was born is shown.

Pisa is wealthy and in a thriving condition. Cottons are largely manufactured. Oil and marble from the vicinity constitute important shipments. The city was formerly a port on the sea, but the silting up of the Arno caused Leghorn to grow in importance. There are fine market halls, an extensive hospital, and four theatres. The rich gardened plain around Pisa, lined with poplars, is interesting despite its flatness. Pop., 1901, 28,046; commune, 61,321; commune, 1911, 65,232; 1914, 66,432.

The city was probably of Etruscan origin. It fell to Rome in 180 B.C. The Romans embellished it and made it important. About 1000 A.D. it became a formidable commercial and naval rival of Venice and Genoa. It played a prominent rôle in the defense and diffusion of Christianity. Its warring citizens took Sardinia from the Saracens and finally destroyed their naval power in the Mediterranean. Corsica and the Balearic Islands fell to them. The city was in the full flower of its greatness in the twelfth and thirteenth centuries, when it took a prominent part in the Crusades. It held the coast from near Genoa to the vicinity of Rome. It had many contests with Lucca and Florence, as it was aggressively Ghibelline. The fall of the Hohenstaufens was a blow to the city, and it met decisive defeat by Genoa in a great sea fight off Meloria, near Leghorn, in 1284. A few years later the Genoese destroyed its harbor. It began to decline, gradually losing all its possessions, and in 1406 fell under the sway of Florence. It shook off the Florentine yoke in 1494, only to be resubjected in 1509. Henceforth its history was part of that of the Florentine state and of Tuscany. In 1551 Pisa had only about 8500 inhabitants. In the height of its prosperity, in the twelfth century, it is said to have had no less than 150,000.

In art history Pisa earned a worthy name until supplanted by Florence. Its cathedral marks the beginning of Italian art of the Middle Ages. The only branch of art, however, in which Pisa left an important influence was architecture (particularly ecclesiastical architecture), though it gave no little impetus to sculpture, being the native city of Nicola Pisano and his son Giovanni. Consult: I. B. Supino, *Il Camposanto di Pisa* (Florence, 1896); Ross and Erichsen, *Story of Pisa*, in "Mediæval Towns Series" (London, 1909); Thomas Gsell Fels, *Oberitalien und Mittelitalien* (9th ed., Leipzig, 1912); Karl Baedeker, *Northern Italy* (14th ed., ib., 1913).

PISA, COUNCIL OF. A council held in the year 1409, not reckoned among the ecumenical councils. It was assembled in the time of the great schism which followed the removal of the popes to Avignon (see *PAPACY*; *SCHISM, WESTERN*), for the purpose of restoring the peace of the Church. The cardinals of both parties, desiring to put an end to the anomalous condition which existed, united to call a general council. Both claimants to the papacy, Gregory XII and

Benedict XIII (antipope), were notified by their adherents and requested to appear at its sessions. Both, however, refused and called synods of their own. The cardinals persisted and proceeded to deliberate upon the case. Twenty-two of them were present, besides some 80 bishops and representatives of over 100 more, with a vast body of abbots, doctors, and other eminent ecclesiastics. After a formal citation of the rival popes the council, on their nonappearance, proceeded to declare them contumacious and to examine their respective claims as though they had appeared. The result, after a protracted inquiry, was a decree by which they were both declared schismatics and deposed from the papal dignity and their followers released from obedience. In the seventeenth session the cardinals entered into conclave to the number of 24 and on June 26 unanimously elected Peter Philargi, who took the name of Alexander V. The council proceeded after his election to pass a number of decrees, for the purpose of giving validity to the acts done on either side during the schism. A vain attempt was made to obtain the submission of the still recusant rivals, and it was resolved that a new council should be held within three years. The authority of this council, like that of the Council of Constance, is alleged by some Gallican divines to establish the superiority of a general council over the Pope. But the contention is made in reply that both these councils, and also that of Basel, must be regarded as abnormal assemblies, called to meet the special emergency of a disputed succession and of a doubtful pope, and that these principles cannot by any means be applied to the ordinary circumstances of the Church, or form a precedent by which to estimate the normal relations between a pope whose title is certain and undisputed and a general council regularly assembled in the ordinary circumstances of the Church.

There were two other councils at Pisa—in 1133, when Peter of Bruys was condemned, and in 1511, when certain cardinals endeavored to have Pope Julius II condemned for not calling a general council to reform the Church. Consult: K. J. von Hefele, *Conciliengeschichte*, vol. vi (Freiburg, 1890); F. Stühr, *Die Organisation und Geschäftsordnung des Pisaner Konzils* (Schwerin, 1891); Mandell Creighton, *History of the Papacy from the Great Schism to the Sack of Rome*, vol. iii (London, 1903); Ludwig Pastor, *History of the Popes from the Close of the Middle Ages*, vol. i (3d ed., ib., 1906).

PISA, UNIVERSITY OF. One of the oldest European universities. Teachers of law and medicine were known at Pisa as early as the twelfth century, but the real beginning of the university dates from the emigration of a large number of students and teachers from Bologna in 1338 on account of the interdict of Pope Benedict XII. At the instance of the Pisans Pope Clement VI authorized the establishment of a *studium generale*, which was dissolved in 1359 for lack of funds. In 1634 a new authorization was obtained from Pope Urban V for its reestablishment. With the loss of Pisan independence in 1406 the university ceased to exist, but it was opened again by Lorenzo de' Medici and flourished for a while. It soon went out of existence again. Cosimo I de' Medici reopened it in 1543 and supported it generously. In 1544 a botanical institute, the first of its kind, was established and the university soon achieved considerable fame. With the decay of Italian uni-

versities it suffered the general fate. It was revived in 1808 by Grand Duke Leopold II of Tuscany, who endowed it munificently. In 1839 it received a well-equipped physical institute. After the revolution of 1848 it was reduced to a mere natural science and mathematics section, but was reopened with all faculties in 1850 and has since maintained a high standing among Italian universities. In 1913 it consisted of the faculties of law, medicine-surgery, philosophy, and mathematics-natural science, and the engineering, pharmacy, veterinary, and higher agricultural schools. The attendance in 1913-14 was 993, and the library contained 202,976 volumes, 97,302 pamphlets, and 814 manuscripts.

PISACA, pē-shā'chā. The name of the most malignant demons in Hindu mythology. In the Vedas they are opposed especially to the pitris (see PITRĪ), and are frequently termed *kravyādas*, or eaters of raw flesh. They infest houses and villages, and as Agni (q.v.) is besought to restore the flesh which the pisacas have devoured from the sick man, they seem to have been ghoulish in nature and associated with ghosts of the malignant dead. In modern India the pisaca is preëminently the spirit of a liar, adulterer, criminal, or lunatic. The legendary accounts of the origin of the pisacas vary. According to the earlier view, they, together with the asuras and rakshasas, were created by Brahma from the stray water which was scattered from the drops out of which gods, men, and other good beings had been formed. Other sources, however, regard them as the offspring of the Prajapatis or of Prajapati (q.v.) himself. Consult A. A. Macdonell, *Vedic Mythology* (Strassburg, 1897), and W. J. Wilkins, *Hindu Mythology* (London, 1900).

PISACA, or PAISACI, LANGUAGES. A group of very archaic dialects, recalling the Vedic in many points, spoken chiefly in the highlands of northwestern India (Laghman, Kafirstan, Chitral, Gilgit, Kashmir, etc.). They form the basis of Kashmiri, in which, however, they are submerged by an influx of other Indo-Aryan elements. They are generally classified as belonging to the Iranian group of the Aryan languages of India as distinguished from the Indo-Aryan group. Among their nearest relatives are the Pashto, or Pushtu, which is the common language of Afghanistan (q.v.), and Baluch, spoken in Baluchistan. According to Grierson, the Paisaci languages are neither of Indian nor of Iranian origin. He maintains that they form a third branch of the Aryan family, which were separated from the parent stem after the branching forth of the original of the Indian languages, but before the Iranian languages had developed their typical characteristics. The Paisacis were hardy northerners who settled in the country inhabited by the ancestors of the speakers of Burushaski, but whether they entered India in the first or the second series of invasions or at some later time cannot be ascertained. There are also traces of these half-barbarous tribes existing in ancient times in Sind and Western Punjab. Consult G. A. Grierson, *The Pisāca Languages of North-Western India* (London, 1906).

PISAGUA, pē-sā'gwā. A town of the Province of Tarapacá, Chile, on the Pacific coast, 46 miles north of Iquique, with which it is connected by rail (Map: Chile, C 7). It is the second city of the province, situated in a desert country, with a fair harbor, well-constructed

streets, and modern houses. The great industry of the town is the shipping of nitrate, which is brought by rail from the interior. In 1911 imports amounted to \$709,327 and exports \$5,311,605. Pop., 1907, 4089. In 1868 and again in 1877 the town was nearly destroyed by earthquakes. On April 18, 1879, in the war of Chile against Bolivia and Peru, it was bombarded and completely destroyed by the Chilean fleet, but after the cessation of hostilities was quickly rebuilt. Near the town (Nov. 19, 1879) occurred a battle in which 6000 Chileans defeated the combined forces of Peru and Bolivia, numbering 11,000.

PISAN, pē-zān', CHRISTINE DE. See CHRISTINE DE PISAN.

PISAN'DER, or **PEISANDER** (Lat., from Gk. Πεισανδρος, *Peisandros*). A Greek poet. He was born at Camirus, or Camirus, in the island of Rhodes, and appears to have lived about 650 B.C., although some critics state that he was earlier than Hesiod and was a contemporary of Eumolpus. He is remembered chiefly for his *Ἡράκλεια*, a poem in two books on the exploits of Hercules (q.v.), only a few lines of which have been preserved. See CANON ALEXANDRINUS. Consult Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. i, part i (6th ed., Munich, 1912).

PISANDER, or **PEISANDER**. An Athenian politician, of the deme (q.v.) of Acharnæ, one of the leaders of the oligarchical party during the Peloponnesian War. (See GREECE, *Ancient History*.) He was prominent in the prosecutions that followed the mutilation of the Hermæ in 415 B.C. (See ALCIBIADES; ANDOCIDES; ANTIPHON; HERM.) In 412 he was one of the commanders of the Athenian fleet. In 411 he helped to establish the council of the Four Hundred at Athens; after the overthrow of the council he fled to Sparta. Consult Plutarch, *Alcibiades*; Thucydides, vi, 27, 60; vii, 49, 63, 89.

PISANELLO, pē-zā-nēl'lo, properly VITTORE PISANO (c.1385-1455). A Veronese painter and the greatest medalist of the early Renaissance. His art shows the influence of Altichiero of Verona and that of Gentile da Fabriano. About 1409-14 he assisted the latter in decorating the ducal palace in Venice and in 1431 and 1432 there is record of his painting frescoes in the Lateran, Rome. After painting other important work of this kind in Florence, he was active from 1438 to 1448 in various places, chiefly in the service of the Este family, of whom he modeled medals and painted portraits. In 1441, in competition with Jacopo Bellini, he painted the portrait of Leonello d'Este now lost, but a vigorous version of this subject by him survives in the Gallery of Bergamo. In 1448 he went to Naples in the service of King Alfonso.

In his own day Pisanello was most celebrated as a fresco and portrait painter. Of his important frescoes all have perished except an early "Annunciation" in San Fermo, Verona, and "St. George and the Princess," Sant'Anastasia, Verona. He delighted in details and had a remarkable talent for the drawing of animals, which he introduced on every occasion.

But it is chiefly as a medalist that Pisanello was most original and important. The medal gave opportunity for his clear-cut drawing, his ability as a portraitist, and fine characterization, and he was the first to raise this kind of work to the dignity of an independent art. His

splendid series of medals of his patrons, beginning with Joan Palæologus, include those of Francesco Sforza, Leonello d'Este, Sigismondo Malatesta (all in the British Museum), Vittorino da Feltre (Berlin), and the different medals of Alfonso of Naples (British Museum). His surviving drawings are numerous and effective. Consult: Jean de Foville (Paris, n. d.); Spaventi (Verona, 1893); Giorgio Vasari, *Lives of the Painters*, vol. i, edited by Blashfield and Hopkins (New York, 1896); and G. F. Hill, *Pisanello* (ib., 1905); also the articles by A. Venturi in various art periodicals.

PISANI, pē-zā'nē. A family of Italian sculptors named from their residence at Pisa. They were the principal artists of the Pisan school, the most important preceding the Renaissance, and are treated under three headings: PISANO, ANDREA, GIOVANNI, and NICOLA.

PISANI, VETTOR (?-1380). A Venetian admiral, son of Admiral Nicolo Pisani. After the renewal of war between Venice and Genoa in 1378, Pisani, as commander in chief of the Venetian naval forces, met and defeated the Genoese fleet off Capo d'Anzio and captured the Genoese admiral (Fieschi). He later recaptured the Dalmatian ports which had been seized by the Hungarian allies of Genoa and for a year sought the other Genoese fleet commanded by Admiral Luciano Doria. When he reached Pola, on his return for repairs, the Genoese fleet appeared. Forced by the civil commissioners to attack a force double his own, Pisani was defeated and upon his return home was sentenced to six months' imprisonment. The Genoese fleet continuing its advance on Venice, Pisani was released and given supreme command afloat and ashore. Eventually he captured the Genoese fleet and military forces—a victory which established the maritime supremacy of Venice.

PISANO, pē-zā'nō, ANDREA (c.1270-1348). One of the principal Italian sculptors of the Middle Ages, a master of the Pisan school. He was the son of Ugolino di Nino, a notary of Pontedera, where probably he was born, and he received his artistic education in the neighboring Pisa, whence his name. When in 1330 a sculptor was sent for to model two doors of the baptistery of the cathedral of Florence, he was chosen as the chief master of Pisa. Before this he had worked principally as a goldsmith. The wax models of the 28 reliefs of the bronze doors were completed within the marvelously short period of three months, but the casting was delayed, and finally was completed by Andrea himself. The gilded portals were dedicated amid great public festivities in 1336. The subjects are 20 scenes from the Life of John the Baptist and eight "Christian Virtues." In contrast to the work of Giovanni Pisano, Andrea's panels are distinguished by paucity of figures, by dignified, reposeful action, and admirable composition. On the death of Giotto in 1336 Andrea succeeded him as the head master of the works of the cathedral. As such he was in charge of the building of the campanile. Andrea probably left Florence in 1343 when the Duke of Athens, who employed him, was expelled. In 1347 he was head master of the cathedral of Orvieto, in charge of building the façade, and he died the following year. While at Florence he founded a school, his chief pupils being Andrea Orcagna and Balduccio da Pisa. Consult the bibliography of PISANO, NICOLA.

PISANO, GIOVANNI (c.1245–after 1314). The most important sculptor of mediæval Italy. The son of Nicola Pisano, he was born at Pisa, where he was his father's apprentice. In 1265 and again in 1267 he is mentioned as his father's assistant in contracts for the pulpit of Siena, in which Giovanni's influence may probably be seen in the crowded composition and dramatic quality of the reliefs. Another early work is the holy-water font of San Giovanni Fuorcivita. For the execution of the fountain of Perugia (1274–78), after Nicola's design, Giovanni was chiefly responsible. In 1277–83 the latter designed and superintended the construction of the Campo Santo of Pisa, the most beautiful in Italy, the arcades of which are masterpieces of round-arched Gothic. This was done in his capacity of *capo maestro* (architect in charge) of the cathedral of Pisa, to which office he was formally appointed in 1278. He was at the same time in charge of the decorations of the baptistery. From 1284 to 1299 he was *capo maestro* of Siena Cathedral. The corner stone of the great façade, after his design, was laid in 1284. The design may still survive in the two lower stories. Certain powerful statues of sages, prophets, and sibyls on the façade and fragments of statues in the cathedral museum are in all probability his work. During the following years he lived chiefly at Siena, becoming a citizen of the town, in which he possessed a house and land and a burial vault near the cathedral. In 1301 he completed the pulpit of Sant' Andrea Pistoja, the most characteristic of his larger works. Decorated with reliefs from the life of Christ and with figures of the prophets and sibyls, it is the culmination of his art. The reliefs are of highest dramatic vigor, and in the statue of one of the sibyls he approaches the majesty and power of Michelangelo. During the first decade of the fourteenth century he was again *capo maestro* at Pisa and in this capacity undertook his most ambitious work of sculpture, the large pulpit of the cathedral. Unfortunately its parts have been dispersed, some of them being utilized in the present pulpit, while others are in the museums of Pisa and Berlin. An important and original work, of which only inconsiderable fragments survive, was the tomb of Queen Margaret, wife of Henry VII, in San Francesco Castelletto (c.1312). In 1314 Giovanni was again in Siena and there he probably remained as *capo maestro* until his death. He is last mentioned in a document of 1314. Besides the works enumerated above he carved many madonnas, powerful yet freely posed and of fine expression. The earliest known is the Madonna of the Campo Santo (1277–84); others are the Madonna with the Two Johns, over the baptistery portal (1295); an ivory statue in the sacristy of Pisa Cathedral; a marble statue in the Arena Chapel at Padua; and the celebrated Madonna della Cintola (of the girdle) in Prato Cathedral (c.1320). Giovanni was an epoch-making figure in Italian art, not only in sculpture, where he introduced a new manner which dominated the century, but, hardly less, in painting, where his influence is reflected by Giotto and certain Sienese masters. Unlike Nicola, who found inspiration in the antique, Giovanni sought it only in nature. He accepted without reserve the spirit as well as the forms of the incoming Gothic art. Whether he learned from the French, from the Germans, or from the Cistercians at San Gal-

gano, near Siena, is a much disputed question which can hardly be decided. His figures are slender, with the familiar Gothic pose; the composition tends to be overcrowded, the action highly dramatic, sometimes exaggerated. But his art always charms by reason of its sincerity, its profound religious feeling, striving after expression rather than after classic beauty. For bibliography, see PISANO, NICOLA.

PISANO, GIUNTA. An early Italian painter. See GIUNTA PISANO.

PISANO, LEONARDO. See FIBONACCI, LEONARDO.

PISANO, NICOLA (c.1210–20–1278–87). An Italian sculptor, the first great precursor of the Renaissance; also reputed an architect. His birthplace is a matter of dispute, some maintaining that he was a native of Apulia, whence he brought an art formed upon classical models. It seems more likely, however, that he was born in one of the two Tuscan towns called Puglia. Nicola's study of the antique, especially of Roman sarcophagi, led him to treat the nude, to aim at rich effects of drapery and at artistic grouping of figures. His earliest known work is a lunette in the cathedral of Lucca representing a "Deposition from the Cross," the "Nativity of Christ," and the "Adoration of the Magi" (c.1237). His masterpiece is the famous six-sided marble pulpit of the baptistery at Pisa, finished in 1260. The body of the pulpit, decorated with five reliefs, rests on Corinthian columns. Between the reliefs are charming statuettes and the columns rest on lions. In one of the reliefs a figure of the high priest seems copied from an Indian Bacchus of an antique vase, while in others there are figures from a Roman sarcophagus, both still in the Pisan Campo Santo. Among the bas-reliefs of the pulpit, which represent scenes from the life of Christ, those of the "Nativity" and "Adoration" are the finest. Nicola's style appears at its best in these broad, majestic, well-balanced figures, treated in very high relief. In 1265 Nicola was commissioned to execute a similar pulpit for the cathedral at Siena, in which he was assisted by his son, Giovanni Pisano (qv), and his other pupils, Arnolfo (qv), Lapo Goro, and Donato. This pulpit was completed in 1268, and while richer in form and sculpture than that at Pisa, has less unity of style. Meanwhile (1265) Nicola had furnished a colleague, Fra Guglielmo d' Agnello, with the designs for a monumental carved marble shrine for the church of San Domenico at Bologna, completed in 1267, the "Arca di San Domenico." None of the reliefs or statues, however, was executed by his hand. Shortly before his death he designed, in 1274, and partly decorated with sculptures the beautiful public fountain at Perugia (see FOUNTAIN), completed by his son Giovanni; the statuettes rather than the reliefs are supposed to be by the father's hand.

As a sculptor Nicola first freed Italian sculpture from the shackles of imperfect technique, created individual types, and had an ideal of beauty. With him the long line of Italian sculptors which culminated in Michelangelo really begins. He was rather the culmination of the Romanesque epoch than the creator of a new style. His son Giovanni Pisano (qv) was the real founder of Italian Gothic sculpture, slender, dramatic, and allegorical, in contrast to the heavy, calm, and classic style of Nicola. Nicola's works as an architect are less certain.

The buildings attributed to him by Vasari, in his *Life of the artist*, are all of problematic authenticity. He is said to have built in Pisa, where San Nicola (especially the tower) and Santa Caterina have been ascribed to him, as has Santa Trinità in Florence, but all without satisfactory evidence.

Bibliography. Giorgio Vasari, *Lives of the Most Eminent Painters, Sculptors, and Architects*, translated by Blashfield and Hopkins, vol. i (New York, 1896); I. B. Supino, *L'Arte Pisano* (Florence, 1904); A. Venturi, *Storia dell' arte italiana*, vols. iii, iv (Milan, 1904-06), a standard account; A. Brach, *Nicola und Giovanni Pisano* (Strassburg, 1904); Hans Graber, *Beiträge zu Nicola Pisano* (ib., 1911); W. G. Waters, *Italian Sculptors* (London, 1911), brief and popular.

PISANO, VITTORE. See PISANELLO.

PISAREV, pē'sa-ryēf, DMITRI IVANOVITCH (1841-68). A famous Russian critic. Born at Znamenka, he graduated from the St. Petersburg Classical Gymnasium and took up philology. A successful review (1859) in the *Dawn*, a magazine for girls, caused him to turn to literature. In 1860 he placed a translation of Heine's *Atta Troll* in Blagosvyetlov's monthly *Russian World*, of which he became coeditor. *Scholastics of the Nineteenth Century* made him the idol of the youth, who asserted that "thenceforth contemporary metaphysics and mysticism were dead." In May, 1862, the monthly was suppressed. In bitter mood Pisarev rewrote a suppressed review of his for an underground publication. As a result he was shut up for nearly five years in the Schlüsselberg fortress, where he wrote his best essays. All his best efforts, critical estimates of contemporary and preceding Russian authors, as well as his popularization of natural sciences, which exercised a powerful influence on the generations of the sixties and seventies, were written here. Given liberty in 1867, he went to recuperate on the shores of the Baltic and lost his life while bathing. Rumors were rife that the government had a hand in the matter. Pisarev's fame rests on his championship of two principles—emancipation of personality and utilitarianism. Scientific achievements during the fifties, Mill's ardent plea for utilitarianism, and the liberation of serfs in 1861 account for Pisarev's ideas as well as for his popularity. Dying at 28, he left 10 volumes of critical works (2d ed., 6 vols., St. Petersburg, 1894).

PISAU'RUM. See PESABO.

PISAY. See PISÉ.

PISCAT'AQUA RIVER. A river about 8 miles in length, forming the southern part of the boundary between Maine and New Hampshire. It empties into the Atlantic, forming at its mouth the harbor of Portsmouth.

PISCES, pīs'sēz (Lat., fishes). One of the main divisions, or phyla, of cold-blooded vertebrates, including the fishes in the more restricted sense. It is well marked off from the lampreys, which are commonly called fishes, and is characterized by the presence of persistent gills and the possession of paired appendages in the form of fins. See FISH.

PISCES. The twelfth sign of the zodiac (q.v.), running from 330° to 360° on the ecliptic (q.v.). It is denoted by the symbol ♓. The constellation Pisces contains no stars brighter than the third magnitude, but there are several double stars with components of

contrasting colors. Owing to the precession (q.v.) of the equinoxes, Aries, the first sign of the zodiac, is now situated in this constellation.

PISCHEL, pish'el, RICHARD (1849-1908). A German Sanskrit scholar, born in Breslau and educated there and in Berlin. He was professor of Sanskrit in Kiel from 1875 to 1885 and then at Halle and in 1902 went to Berlin. Pischel's especial field was classical Sanskrit and more particularly the drama. He urged its independence from the Greek drama and was particularly fortunate in his conjectures of dates and authors for famous plays. But he wrote as well on the Vedic period, publishing *Vedische Studien* (3 vols., 1889-1901), with Geldner, and on Prakrit grammar, *Hemacandras Grammatik der Prakritsprachen* (1877-80); a Prakrit dictionary, *The Deçināmāṇī of Hemacandra* (1880), with Bühler; *Grammatik der Prakritsprachen*, etc. (1900). His further work includes: *Kālidāsa's Āṅkuntalā; The Bengali Recension* (1877); *Rudrāṭa's Āṅgārātilaka* (1886), a rhetorical work; *Die Heimat des Puppenspiels* (1900; Eng. trans. by Mildred Tawney, London, 1902); *Materialien zur Kenntnis des Apabhramsa* (1902); *Leben und Lehre des Buddha* (1906); *Die indische Literatur in Die orientalischen Literaturen* (1906).

PIS'CICULTURE. See FISH CULTURE.

PISCINA, pīs-sī'nā (Lat., fish tank). A water tank, especially the cold plunge or swimming basin for a Roman bath. In ecclesiastical and modern usage, a small basin supplied with running water, particularly such a basin in a decorative setting applied to or set in a wall, as in the chancel of a church for the washing of the chalice after mass or in the sacristy for the use of the clergy. These were often highly ornate in the mediæval and early Renaissance periods, consisting of a wall niche, either single or double, richly adorned, containing one or two faucets and a sculptured basin projecting from the wall.

PISCINA MIRABILIS. See MISENO, CAPE.

PISÉ, pēz'ā, or **PISAY** (Fr., pounded, brayed, crushed). The material and the process of using earth of a clayey consistency for building by stamping it hard in place to drive out the moisture. Any soil that is found to pack in the hand may be used. Where the soil is very fat, with much clay in it, this construction is capable of enduring many years. It is sometimes called *adobe* (q.v.) in the Southwestern States. The material differs from crude or unburned brick in being made up in the mass instead of being shaped in blocks for building. See BRICK.

PISEK, pīs'ēk. A small town of the Crownland of Bohemia, Austria, situated on the Wotawa, an affluent of the Moldau, 55 miles southwest of Prague (Map: Austria, D 2). It is still partly surrounded with walls, has an old castle, a Gymnasium, a Realschule, and schools of agriculture and forestry. The manufactures are woolen and cotton fabrics, iron wire, and musical instruments. Pop., 1900, 13,574; 1910, 16,474.

PISEMSKI, pē'syēm-skē, ALEXEI FEOFILAKTOVITCH (1820-81). A Russian novelist, born in the Government of Kostroma. He was educated in Kostroma and at the University of Moscow. Until his retirement in 1874 he was in the government service. His literary activity dates from *Boyarshchina* (1847). There followed *Tyufyak* (1850), *A Love Match*, and the drama

of peasant life, *A Bitter Lot* (1853), *Pitersh-chik*, and *A Thousand Souls* (1858). In these Pisemski appears as a severe realist, picturing life in its lower aspects without compassion or censure and at times verging on cynicism. His pessimism discovers only the basest motives for all action. In *A Thousand Souls* he dwells only on the shortcomings of the liberal movement. With a heart embittered by his critics, he published in 1863 his last great effort, *Troubled Waters*. The works following it, *Men of the Forties* (1869), *Whirlpool* (1871), *Burgesses* (1877), *Freemasons* (1878), and many plays, showed a falling off in his powers. Grief at the death of his two sons, both professors at the Moscow University, hastened his end. His works were published in 24 volumes (St. Petersburg, 1895).

PISGAH, piz'gá (Heb. *Pisgah*, boundary, from *pāsag*, to divide). A mountain of the Abarim Range, east of the Dead Sea. It is to be noticed that "Pisgah" never occurs by itself in the Old Testament, but always with the definite article in connection with "top" or "slopes." In Deut. xxxiv. 1 the "top of the Pisgah," from which Moses viewed the promised land, is identified with Mount Nebo (q.v.), and in the days of Eusebius "Fasga" was still used for the region of Mount Nebo. The double name may, for all that, point to varying traditions in regard to the incident in the career of Moses.

PISIDES, pis'i-déz (Lat., from Gk. *Πισίδης*), GEORGIOS. See GEORGE, called PISIDA.

PISIDIA (Lat., from Gk. *Πισιδία*). An ancient division of Asia Minor, bounded on the north by Phrygia, east by Cilicia, south by Pamphylia, and west by Lycia (Map: Greece, Ancient, G 3). It belongs to the modern Turkish Vilayet of Konieh. It was drained by the Cestrus, Eurymedon, and Melas, the chief rivers of Pamphylia. The principal towns were Selge, Termessus, and Sagalassus. Antioch, sometimes called the Pisidian, seems to have been really in Phrygia. The wines of Amblada in Pisidia were celebrated, and salt and olives were chief productions. The country is wild and mountainous, abounding in picturesque scenery, and the inhabitants were bold and lawless freebooters who defied subjugation (according to Xenophon, the first writer to mention the Pisidians, *Anabasis*, i, 1, 11; ii, 1, 4). The cities, however, were gradually Hellenized, and in Roman times the country seems to have enjoyed great prosperity, as is indicated by the splendid ruins at several places. Consult Lanckoronski, *Städte Pamphylens und Pisidiens* (Vienna, 1890).

PISISTRATUS, or **PEISISTRATUS** (Lat., from Gk. *Πεισιστρατος*, *Peisistratos*) (?-c.527 B.C.). The famous tyrant of Athens, son of Hippocrates and intimate friend of the lawgiver Solon, with whom he was closely related on his mother's side. He received an excellent education, and the charm of his manners as well as the generosity of his spirit was so great that, according to Solon, had he not been ambitious he would have been the best of the Athenians. But his desire for sovereign power led him to adopt a policy of artifice to attain his ends, which has deprived him of the reputation that the kindly character of his government might otherwise have obtained for him. Pisistratus first became prominent in connection with the war between Megara and Athens, which culminated in the capture of the Megarian seaport Nisæa and the island of Salamis by Athens about

570-565 B.C. In this struggle he may have held the office of polemarch, and his ambition then spurred him to take advantage of the popularity thus gained to seize the sovereign power. He came forward as leader of one of the three parties into which Attica was then divided. These were the Pediaci (*Πεδιακοί*), or the Party of the Plain, consisting of the well-to-do landed proprietors; the Parali (*Παραλοί*), the Party of the Seaboard, to which belonged the wealthy merchant classes; and the Diacrii (*Διακρίοι*), the Party of the Highlands, chiefly a laboring population, jealous of the rich and eager for political equality. (In the *Journal of Hellenic Studies*, 1906, however, P. M. Ure argued that the Diacrii were rather the miners of Laurium, q.v.) Pisistratus joined the Diacrii, and by his liberality attached to himself all the poorer citizens and the discontented. When the time came for a decisive step, he drove into the market place, and there, exhibiting certain wounds actually self-inflicted, called upon the people to protect him against his and their enemies, alleging that he had been attacked on account of his patriotism. Thereupon his followers, according to Plutarch, were ready to take up arms for him, a general assembly of the citizens was summoned on motion of Aristion, one of his supporters, and it was voted to allow him a bodyguard of 50 men armed with clubs. Tradition says that Solon charged him with hypocrisy, but in vain. Pisistratus gradually increased the number of his armed attendants, and about 560 B.C., when he felt himself strong enough, he seized the Acropolis and established himself as tyrant over Athens. The leaders of the aristocratic party immediately fled from the city. What action Solon took is not definitely known; he died within two years after the establishment of Pisistratus' irresponsible rule. This rule, however, was not harsh or vindictive. Pisistratus attempted to continue unchanged the constitution laid down by Solon himself and conferred many benefits upon the poorer citizens. But the parties of the Plain and the Seashore united against him and in five years succeeded in driving him out. This coalition in turn was soon broken up, and Megacles, one of its leaders, made overtures to Pisistratus and secured his return. A family quarrel between them, however, caused a second expulsion of the tyrant about 550. He retired to Eubœa, where he remained for 10 years, watching for his opportunity and making preparations to secure his return. He gained a following in many of the Greek cities, exploited the gold mines of Mount Pangæus, near the Strymon, and collected a force of mercenary soldiers. At length he was strong enough in friendship with other Greek states to attack Athens. When he landed at Marathon adherents flocked to his standard, and, after defeating the constitutional party, he reestablished himself for the third time as tyrant, about 540. He continued to hold this position without interruption until his death in 527 (528). Then his power passed into the hands of his sons Hippias and Hipparchus (q.v.).

Pisistratus' rule was mild and beneficent. He reduced taxes, established the poorer citizens on estates, supplying them with the needed resources, cared for the old and the disabled, and extended Athenian influence abroad. He recovered Sigeum, which commanded the entrance

to the Hellespont, and acquired the Thracian Chersonese. His administration is famous also for his encouragement of literature and the arts. Under his direction a splendid temple to Athena was erected on the Acropolis, and the Lyceum was built. He erected also a temple to Dionysus in Limnæ and established a new sanctuary for this god at the foot of the Acropolis. He began the great temple of Olympian Zeus, which was not finished till the reign of the Emperor Hadrian. (See ATHENS, *History*, next to last paragraph.) He carried through many internal improvements also, the most significant being that of the water supply. He purified Delos (q.v.), the great shrine of the Ionian race, by removing all bodies buried within the sacred precinct. He made the Athenian religious festivals, in particular the great Panathenaic festival, more magnificent than they had ever been before. (See PANATHENÆA.) He had a new edition of the Homeric poems prepared by poets and scholars resident at his court. Consult the standard histories of Greece, and Robert von Pöhlmann, *Grundriss der griechischen Geschichte* (5th ed., Munich, 1914). See HOMER.

PISO. A Roman family of the plebeian gens (q.v.) Calpurnia. (See CALPURNIUS.) The agnomina (see AGNOMEN) of the family were Frugi, Cæsoninus, and Licinianus. Its more important members are: LUCIUS CALPURNIUS PISO FRUGI. In 149 B.C., as tribune of the plebs, he brought up the first law against extortion (*Lex Calpurnia de Repetundis*); in 133 he was consul, fought in the Servile War in Sicily, and was censor in 120. He opposed the reforms of the Gracchi. He is best known as author of an annalistic history of Rome down to his own time, of which a few fragments are published in Peter's *Historicorum Romanorum Reliquæ*, vol. i (Leipzig, 1870, 1914), and in the same writer's *Historicorum Romanorum Fragmenta* (ib., 1883). Consult also M. Schanz, *Geschichte der römischen Literatur*, vol. i, part i; 3d ed. (Munich, 1907).—LUCIUS CALPURNIUS PISO CÆSONINUS was the father-in-law of Julius Cæsar and in 58 became consul as a tool of Cæsar. He supported Clodius (q.v.) against Cicero, caused the banishment of the latter, and was twice vehemently attacked by Cicero for vicious administration of the Province of Macedonia. Having become censor in 50, Piso attempted to mediate between Cæsar and the aristocratic party, but was unsuccessful and, failing to join Cæsar in the Civil War, now won Cicero's hearty approbation. After Cæsar's murder Piso seems to have sided with Antony.—His son, who bore the same name (48 B.C.–32 A.D.), was high in the favor of Augustus and Tiberius, held the consulship (15 B.C.), and as prefect of the city (17 A.D.) was highly praised by Velleius Paterculus.—GNÆUS CALPURNIUS PISO was consul with Tiberius (7 B.C.) and became his tool to check and harass Germanicus (q.v.) in the East, receiving the command of Syria (18 A.D.). He and his wife, Plancina, were suspected of poisoning Germanicus; Piso was abandoned by Tiberius, on whose orders he had acted, and in 20 A.D. committed suicide.—GAIUS CALPURNIUS PISO, a brilliant and popular young man, was robbed (37 A.D.) of his newly married wife by Caligula and banished by that Emperor. Under Nero he joined a conspiracy to murder the tyrant; on its discovery he opened his veins and died. He may be the Piso addressed in

the panegyric *De Laude Pisonis*.—The last Piso to attain fame was LUCIUS CALPURNIUS PISO LICINIANUS, an adopted member of the family, who was named by Galba as his successor to the Empire and was killed when Otho came to the throne (69 A.D.).

PISQUOW, pîs'kô. See SALISHAN STOCK.

PISSARO, pè'sà'rô', CAMILLE (c.1830–1903). A French landscape and figure painter and etcher. He was born at St. Thomas (Antilles) and studied under Fritz Melbye at Carâcas and under Corot in Paris, where he came to live in 1855. Already well known as a strong landscape painter when the Impressionist movement began, he joined the innovators and went with Monet to England, where he was influenced by Constable. On his return he settled at Pontoise (Normandy). For a time he was head of the offshoot from the Impressionists, called the Pointillistes, but afterward he resumed the usual Impressionist style. Like Monet, he is a painter of sunshine and of subtle effects of light, and, like Millet, he is the painter of the peasant and the field. His latest works are mostly views of Paris and the cities of Normandy, painted from the window of a house and always bathed in light and fresh with vibrant color. He is represented in the Luxembourg by seven paintings, including "The Red Roofs," "The Orchard," and "The Laundry." His etchings, a representative series of which is in the Luxembourg, possess great individuality and subtlety of line. Pissaro's son LUCIEN also made a name as a draftsman and wood engraver. Consult George Moore, *Modern Painting* (London, 1893), and Theodore Duret, *Manet and the French Impressionists* (Eng. trans. by J. E. C. Flitch, Philadelphia, 1910).

PISSELEU, pès'lê', ANNE DE. See ESTAMPES, or ETAMPES.

PISTACHE, pîs-tâsh'. A genus of trees. See PISTACIA.

PISTACIA, pîs-tâ'shî-â (Lat., from Gk. *πιστάκη*, *pistakê*, pistachio tree, from Pers. *pistâ*, pistachio nut). A genus of trees of the family Anacardiaceæ, having dioecious flowers without petals and a dry drupe with a bony stone which splits into two valves when ripe, exposing the bright green oleaginous kernel, which is used



PISTACHIO NUTS (*Pistacia*).

to flavor culinary preparations, ices, etc. The pistacia or pistachio tree (*Pistacia vera*), a native of Persia and Syria, now cultivated in south Europe, north Africa, and elsewhere, and in many places naturalized, attains a height of about 20 feet, has pinnate leaves, flowers in

racemes, ovate fruit about the size of an olive. In the south of Europe and in the East pistachio nuts, sometimes called green almonds, are much esteemed and are exported to some extent, although they very readily become rancid. Oil is expressed from them for culinary and other uses. In cultivation one male tree is allowed to five or six fertile ones. The mastic tree, or lentiak (*Pistacia lentiscus*), yields the gum resin called mastic (q.v.). It is a native of the countries around the Mediterranean. The turpentine tree (*Pistacia terebinthus*) yields the turpentine (q.v.) known in commerce as Cyprus turpentine, Chian turpentine, or Scio turpentine, which resembles honey in consistency, is greenish yellow, pleasant-smelling, and mild-tasting, and in its properties resembles the turpentine of the pines, but lacks acidity. The tree is about 30 or 35 feet in height, has pinnate leaves (of about three pairs of leaflets and an odd one), flowers in compound racemes, and nearly globular fruit. The kernel of the fruit is oleaginous and pleasant. The batoum tree (*Pistacia atlantica*), a round-headed tree of about 40 feet in height, a native of the north of Africa, produces a fruit much used by the Arabs and a gum resin of pleasant aromatic odor and agreeable taste. This is chewed to clean the teeth and sweeten the breath. The fragrant oil of the kernels of *Pistacia oleosa*, a native of Cochin-China, is used by the people of that country to impart a perfume to ointments.

PIS'TIL (from Lat. *pistellum*, *pistillus*, pestle). The central organ of an ordinary flower, containing the ovules and developing into the seed case. It is a term of convenience rather than of morphological exactness, for a pistil may consist of one or more carpels. This variation is recognized in the terms "simple" and "compound" pistils. See FLOWER.

PISTOLA, pē-stō'yā, or **PISTOJA**. A city in the Province of Florence, Italy, situated at the foot of the Apennines, 20 miles northwest of Florence by rail (Map: Italy, C 3). It is well built, and it is surrounded by lofty and well-preserved walls. The city played a prominent part in the early history of architecture and sculpture, and many of its churches bear marks of the influence of the Pisani. The cathedral, built in the twelfth and thirteenth centuries, contains a remarkable silver altar and a monument to Cardinal Portogruerra, considered as the first work in marble by Verrocchio. Sant' Andrea, one of the oldest churches of Pistoia, is noted for its pulpit, the work of Giovanni Pisano, and San Francesco al Prato is remarkable for its frescoes of biblical scenes. The ancient palaces of Pistoia are especially interesting. The Ospedale del Ceppo is beautifully decorated with terra-cotta reliefs (dating from the sixteenth century) and medallions representing biblical scenes. The Palazzo del Comune and the Palazzo Pretoria are both in the Italian-Gothic style of the fourteenth century. There are an imposing bishop's palace, a seminary, an academy of sciences, and two libraries. The principal manufactures are iron and steel wares, especially firearms, silks, linens, woolens, paper, and glass. Pistols are said to have been first made here, whence the name. Pop. (commune), 1901, 62,606; 1911, 67,653, (town) 13,400.

Pistoia is the Roman Pistoria, where Cati-line was defeated in 62 B.C. It was the scene of

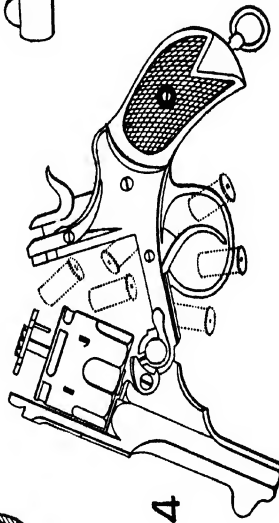
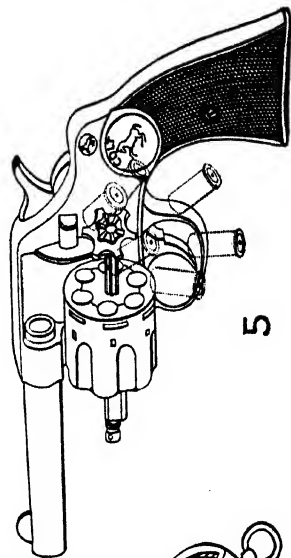
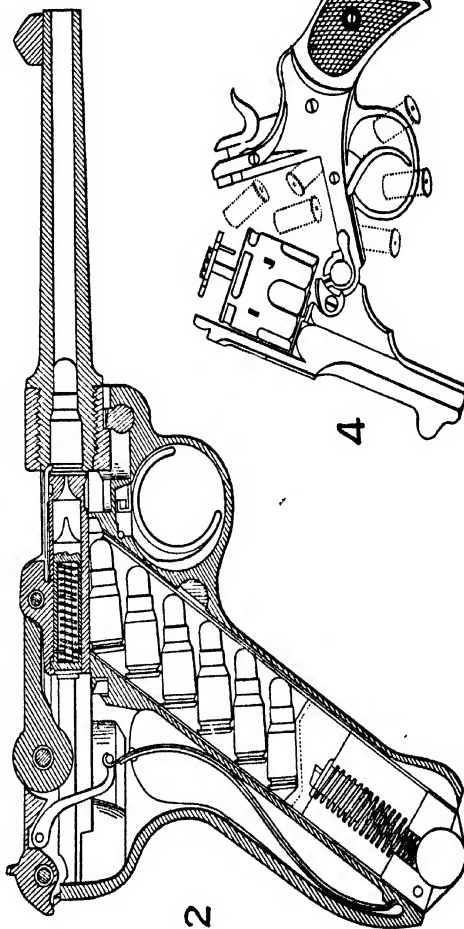
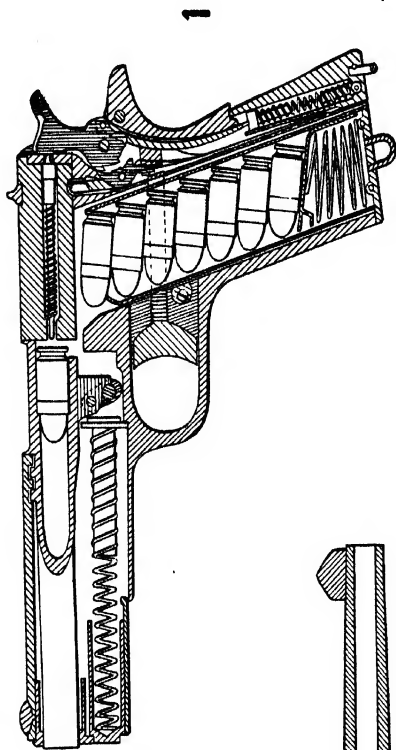
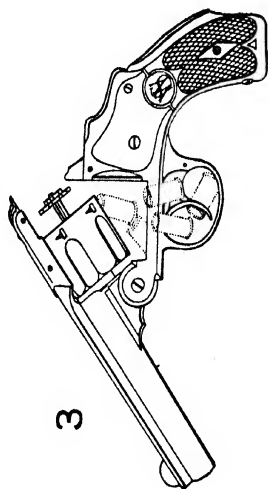
much factional strife between the Ghibellines and the Guelphs. In the fourteenth century it became subject to Florence. Consult A. R. Sheldon, *Pistoja* (New York, 1904).

PISTOJA, CINO DA. See CINO DA PISTOJA.

• **PISTOL** (OF. *pistole*, from It. *pistola*, pistol, dagger, from *Pistoia*, from Lat. *Pistoria*, a town in Italy, near Florence). This member of the small-arms group was developed soon after the invention of the wheel lock, in the desire to supply horse soldiers with a firearm. The result was a weapon called the pistol, which was first manufactured at Pistoia in Etruria, about 1540, by Camillo Vettelli. At their first appearance they were distinguished by very short barrels and heavy, clumsy butts, which, surmounted by enormous caps, were very nearly at right angles with the barrel. It was not long, however, before the butts were lengthened out almost in a line with the barrels. The great majority of the pistols used in the sixteenth and seventeenth centuries were fitted with wheel locks, for which they were best adapted. Dag was the name of a peculiar and heavy pistol in common use towards the middle of the seventeenth century. German manufactured pistols of the wheel-lock type had also been adopted by many of the important cavalry corps of continental Europe, foremost among whom were the Ritters of Prussia. (See CAVALRY.) It is to dueling, however, that the pistol is indebted for nearly all the improvements since made in its effectiveness; for while occasional slight alterations have been made in the general pattern, the exterior appearance and method of handling the dueling pistol of the nineteenth century was virtually identical with that of the eighteenth. For military and sporting purposes the pistol has experienced many strange shapes and designs during its evolution into the modern revolver. The earliest type seems to have been an arquebus with four chambers, a specimen of which is in the Tower of London armory and is said to have been the personal property of Henry VIII. It belongs to the early part of the sixteenth century and has a barrel 2 feet, 9 inches long, and the chamber 7½ inches, the bore being about ½ inch. There is a separate flashpan for every chamber, which was covered with a sliding lid and moved in rotation beneath the serpentine. The barrel, which is secured to the spindle, is strengthened by a rod fastened to its top, and the other extremity is fixed to the butt of the gun. The lock consisted of a serpentine, passing through the stock and secured by a pivot. The serpentine extended below and behind the pivot and thus formed a trigger, which on being pressed allowed the serpentine to fall into the flashpan, the weight of the trigger acting as a balance and restoring it to its original position. In every instance the chamber had to be moved round by hand.

Devices for the combination of firearms with some other form of weapon have been frequent from the days of the first discovery of firearms up to the beginning of the twentieth century. The combination most frequently used has been the pistol and the battle-axe, examples of which in the fifteenth century are not uncommon. The Dresden Museum is especially rich in examples of these and similar weapons. Combinations of pistols and daggers were also frequently met with between the fifteenth and eighteenth centuries; since then and up to the present day inventions are constantly being recorded which

PISTOLS AND REVOLVERS



TYPICAL PISTOLS AND REVOLVERS

1. COLT AUTOMATIC PISTOL CALIBRE .45
2. BORCHARDT-LUGER AUTOMATIC PISTOL
3. SMITH & WESSON ARMY REVOLVER
4. UNITED STATES ARMY MODEL
5. COLT UNITED STATES ARMY REVOLVER

have the same principle for their base. In 1896 a patent for a combined dagger and pistol was issued from the English Patent Office, and about the same time a pistol lance was being advocated in both Russia and Germany, as an essentially effective cavalry weapon. The invention of the revolver, which is discussed under its own head, caused the pistol to be used principally for dueling and target shooting, and excellent weapons were made for these purposes. The revolver with its six or seven shots served as an important, valuable military weapon on account of its effectiveness at close range, but at the beginning of the twentieth century the pistol began again to replace the revolver for military and other purposes. These pistols, however, differed from previous types in that they were automatic in their action, firing, ejecting, and reloading by utilization of the energy of recoil. These pistols have advantages over the revolver, which supplanted the old pistol, because they possess greater power, can carry more ammunition in the magazine, and are more accurate in firing. Where in the revolver the rounds of ammunition are placed in a revolving drum, the size of which is necessarily limited, in the pistol the ammunition is carried in clips placed inside the stock. Where in the revolver the chamber is in the revolving drum and therefore separate from the barrel, in the pistol the chamber is continuous with the bore, thereby enabling greater utilization of the power of the charge.

Many of the British officers in the Boer War of 1899-1902 were equipped with automatic pistols, while in countries like Germany, where the officers' equipment is supplied by the government, a self-loading pistol rapidly replaced the revolver. The four best-known types are the Mauser, the Burchardt-Luger, the Colt, and the Mannlicher. Probably the best European example is the Burchardt-Luger, operated by the utilization of the gas arising from its discharge, which is made to operate the mechanism, open the breech, extract and expel the cartridge, reloading and reclosing the breech for a new discharge. The firer merely replenishes the ammunition when necessary and pulls the trigger. It is capable of firing 103 shots a minute, or 48 shots in 28 seconds. It is of 7.65 millimeters (0.301 inch) in calibre and has a length of barrel of 120 millimeters. At the moment of firing the gas, acting on the base of the cartridge case, forces back the barrel and breech casing, causing them to slide along the grooves of the frame. The detachable breech follows the movement, but both breech and barrel are firmly connected. The cartridge case, which is operated by the extractor, strikes against the ejector projecting out on the interior right wall of the breech casing and is expelled, thus making way for the top cartridge of the magazine, which is forced in front of the cylinder by an interior spring. A double spring compressed by the recoil forces the detachable breech sharply forward. The trigger is pressed, the firing pin is released, and the cartridge exploded. When the magazine is exhausted the lug of the magazine presses a separate spring projecting in the frame and catching in the notch of the cylinder. At the same time the breech, instead of moving forward, is held in an elevated position in the rear. The line of sight being concealed, the firer is made aware that his weapon is empty. The pistol is recharged

with a fresh magazine, which is inserted in the butt, an operation that may be performed instantly; and as the weapon may be kept in use for a considerable time without cleaning, this constitutes one of its greatest values.

The United States automatic pistol, calibre 0.45, which replaced the Colt army revolver, is a slight modification of the Colt automatic pistol, invented by J. M. Browning. The three principal parts of the pistol are the receiver, the barrel, and the slide. The receiver has suitable guides for the reciprocating slide, and a hollow handle in which the magazine is inserted from below and locked in place by the magazine catch. The barrel of the pistol is largest at the breech and at the top has two transverse locking ribs, the forward edges of which, together with the forward edge of the breech portion, serve positively to interlock the barrel with the slide when in the firing position. On the top of the slide are mounted both the front sight and the rear sight.

The magazine may be charged with any number of cartridges from one to seven, and when charged it is inserted in the handle and the slide is drawn once to the rear. This movement cocks the hammer, compresses the recoil spring, and, when the slide reaches the rear position, the magazine follower raises the upper cartridge into the path of the slide. The slide is then released and, being forced forward by the recoil spring, carries the first cartridge into the chamber of the barrel. As the slide approaches its forward position, it encounters the rear extension of the barrel and forces the barrel forward; the rear end of the barrel swings upward on the link, turning on the muzzle end as on a fulcrum. When the slide and barrel reach their forward position, they are positively locked together by the locking ribs on the barrel, and their joint forward movement is arrested by the barrel lug encountering the pin on the slide stop. The pistol is then ready for firing.

When the hammer is cocked the hammer strut moves downward, compressing the main spring, and the sear, under action of the long leaf of the sear spring, engages its nose in the notch on the hammer. On pulling the trigger the sear is moved, and the released hammer strikes the firing pin, which transmits the blow to the primer of the cartridge. The pressure of the gases generated in the barrel by the explosion of the powder in the cartridge is exerted in a forward direction against the bullet, driving it through the bore and in a rearward direction against the face of the slide, driving the latter and the barrel to the rear together. The downward swinging movement of the barrel unlocks it from the slide, and the barrel is then stopped in its lowest position. The slide continues to move to the rear, opening the breech, cocking the hammer, extracting and ejecting the empty shell, and compressing the recoil spring, until it (the slide) reaches its rearmost position, when another cartridge is raised in front of it and forced into the chamber of the barrel by the return movement of the slide under pressure of the recoil spring.

When the magazine has been emptied the pawl-shaped slide stop will be raised by the magazine follower, under action of the magazine spring, into the front recess on the lower left side of the slide, thereby locking the slide in the open position and serving as an indicator

to remind the shooter that the empty magazine must be replaced by a charged one before the firing can be continued. Pressure upon the magazine catch quickly releases the empty magazine from the handle and permits the insertion of a loaded magazine.

MISCELLANEOUS DATA CONCERNING UNITED STATES ARMY AUTOMATIC PISTOL

Weight, 2 pounds, 7 ounces.
Trigger pull, 8 to 7½ pounds.
Total length, 8.593 inches.
Barrel:
Length, 5.025 inches.
Diameter of bore, 0.445 inch.
Rifling:
Grooves:
Number, 6.
Width, 0.1522 inch.
Depth, 0.003 inch.
Lands, width, 0.072 inch.
Twist, one turn in 16 inches, left-handed.
Front sight above axis of bore, 0.5597 inch.

This pistol has been fired 21 times in 12 seconds, beginning with pistol empty and loaded magazines on a table at side of operator. The trajectory with ammunition (model of 1911) for 250 yards has a maximum ordinate of 4.29 feet at 126 yards from the muzzle. The trajectory is very flat up to 75 yards, at which range the pistol is accurate. The angle of departure is 1° 13' 37". With the angle of departure equal to 45°, the range is approximately 1955 yards, the maximum ordinate of the trajectory being 2219 feet. The muzzle velocity of the bullet, weighing 230 grains, is 800 feet per second.

PISTOL. A character in Shakespeare's *Henry IV*, *Henry V*, and *Merry Wives of Windsor*, a braggart and blusterer, the follower of Falstaff and husband of Dame Quickly.

PISTORIA. See **PISTOLA**.

PI'SUM. The generic name of the pea (q.v.).

PITAKA, pit'ā-kā (Pali, basket). Any one of the three divisions of the Buddhist Scriptures. The three pitakas, collectively termed *tripitaka* or *pitakattaya* (basket triad), are the *Vinaya-pitaka* (Basket of Discipline), the *Suttapitaka* (Basket of Discourses), and the *Abhidhamma-pitaka* (Basket of Metaphysics). The *Vinaya-pitaka* is composed of five works, the *Bhikkhu-Vibhanga* (Monk's Division), *Bhikkhuni-Vibhanga* (Nun's Division), *Mahā-Vagga* (Great Chapter), *Culla-Vagga* (Little Chapter), and *Parivāra-Pāṭha* (Concluding Text). While much of this is dry and technical, it has many passages of interest. The *Sutta-Pitaka* is the most important of the three for the philosophy and folklore of Buddhism. It is composed of the following five books: *Dīgha-Nikāya* (Long Collection), *Majjhima-Nikāya* (Medium Collection), *Samyutta-Nikāya* (Connected Collection), *Anguttara-Nikāya* (Add-One Collection), and *Khuddaka-Nikāya* (Little Collection), which is subdivided into 15 parts, *Khuddaka-Pāṭha* (Little Text), *Dhammapada* (Religious Sentences), *Udāna* (Out-Breathing), *Itivuttaka* (Thus Said), *Sutta-Nipāta* (Descent of Aphorisms), *Vimāna-Vatthu* (Palace Stories), *Peta-Vatthu* (Ghost Stories), *Thera-Gāthā* (Stanzas of the Elders), *Thēri-Gāthā* (Stanzas of the Female Elders), *Jātaka* (Birth Stories), *Nidāsa* (Exposition), *Paṭisambhida-Magga* (Way of Analysis), *Apadāna* (Achievement), *Buddha-Vamsa* (Lineage of the Buddha), and *Cariya-Pitaka* (Basket of Conduct). The last pitaka is of all the least interesting. It is composed

of seven books, *Dhamma-Saṅgati* (Enumeration of Duties), *Vibhanga* (Division), *Kathā-Vatthu* (Subject of Discourse), *Puggala-Paṇṇatti* (Manifestation of Persons), *Dhātu-Kathā* (Discussion of Elements), *Yamaka* (Twofold), and *Paṭṭhāna* (Cause).

Bibliography. H. C. Warren, *Buddhism in Translations* (Cambridge, Mass., 1896); Max Walleiser, *Die buddhistische Philosophie in ihrer Geschichte entwickelt* (Heidelberg, 1904-11); Léon de Milloué, *Bouddhisme* (Paris, 1907); Roussel, *Le bouddhisme primitif* (ib., 1911); Mrs. Rhys-Davids, *Buddhism* (London, 1912); Dudley Wright, *Manual of Buddhism* (ib., 1912).

PITAVAI, pé'tā'vāl', FRANÇOIS GAYOT DE (1673-1743). A French legal writer. He entered the army, but afterward studied jurisprudence and in 1713 became an advocate at Paris. He is chiefly known for the compilation of *Causes célèbres et intéressantes* (20 vols., 1734-43). From him a similar collection, begun by Hitzig and Häring at Leipzig in 1842, took the name *Der neue Pitaval* (2d ed., 36 vols., 1857-72; N. S., 24 vols., 1866-91).

PITCAIRN. A borough in Allegheny Co., Pa., 15 miles by rail east of Pittsburgh, on the Pennsylvania Railroad (Map: Pennsylvania, B 6). It contains railroad yards and shops, employing almost 10,000 men, and extensive machine shops, foundries, and electrical-supply factories. There are also several coal mines and brickworks. The electric-light plant is owned by the borough. Pop., 1900, 2601; 1910, 4975.

PITCAIRN, JOHN (c.1740-75). A British soldier born in Fifeshire, Scotland. He entered the marine service and became captain in January, 1765, and major in April, 1771. For seven years he was stationed in Boston and won the respect of the citizens. He was a member of the force under command of Lieut.-Col. Francis Smith sent by General Gage to destroy the military stores collected at Concord, April 19, 1775. The minutemen at Lexington, refusing to disperse at his order, were fired upon, and seven were killed. Major Pitcairn maintained until his death that the minutemen fired before the soldiers. In the battle of Bunker Hill, June 17, he was first in the third and fourth charges and was mortally wounded by a negro soldier. His son DAVID became a distinguished surgeon.

PITCAIRNE, ARCHIBALD (1652-1713). A Scottish physician and writer, born in Edinburgh. He studied medicine in Edinburgh, Paris, and Rheims (M.D., 1680), and settled in his native city, where he remained except for a year (1692-93) at Leyden as professor of medicine. By opening a free dispensary for the poor he was permitted to perform autopsies upon those whose bodies were not claimed. Pitcairne also wrote Latin verse (published 1727) and a poem, *Babell*, in which he satirized prominent Presbyterian ministers (1692; reprinted, 1830). His *De Legibus Naturalibus* (1696) is a severe attack on Sir R. Sibbald's *Prodromus Historiæ Naturalis* and his *Dissertationes Medicæ* (1701; 2d ed., 1713) includes, among other topics, the cure of fevers by purgation, the effects of acids and alkalies, and the circulation of blood (vindicating Harvey). Pitcairne's collected works appeared in two volumes in 1722. His medical library was bought by Peter the Great of Russia.

PITCAIRN ISLAND. One of the most easterly of the Polynesian islands and the southernmost member of the Low Archipelago. It lies in the Pacific Ocean, in lat. $25^{\circ} 3' S.$ and long. $130^{\circ} 19' W.$, is about 2 miles long and 1 mile broad, and consists of a mountain surrounded by coral reefs (Map: World, M 8). It was discovered by Carteret in 1767, but was uninhabited till 1790, when it was settled by a company consisting of nine mutineers from H. M. S. *Bounty* (see BLIGH, WILLIAM) and 18 natives from Tahiti (6 men and 12 women). During the 10 years following their settlement the island was a scene of disorder and lawlessness. In the year 1808 the sole survivors of the original settlers were one Englishman by the name of John Adams (formerly Alexander Smith), 8 or 9 women, and several children, the rest having fallen victims to disease and violence. The elements of disorder having been removed, the island began to grow under the wise management of Adams. In 1808 Pitcairn was visited by an American sealing ship and in 1815 by H. M. S. *Britann*, whose captain was very favorably impressed with the peace and good order prevailing. In 1839 it was formally taken possession of for the British crown, and in 1855, when the number of inhabitants had reached 200, which was more than the island could maintain, they petitioned the British government to be removed to Norfolk Island (q.v.), which was done in the following year. Since then some of them have returned to Pitcairn, whose population by the census of 1911 was 145 (40 adult males, 45 adult females, 43 children aged 6 to 16, and 17 infants under 6). Consult: Sir John Barrow, *A Description of Pitcairn's Island and its Inhabitants* (New York, 1836); W. Brodie, *Pitcairn's Island* (London, 1850); Diana Jelliffe, *The Mutineers of the Bounty and their Descendants in Pitcairn and Norfolk Islands* (ib., 1870); T. B. Murray, *Pitcairn. The Island, the People, and the Pastor* (new ed., ib., 1885).

PITCH (assibilated form of *pick*, AS. *pician*, Ger. *picken*, to pick, connected with Eng. *pipe*). That characteristic of a sound which is determined by the rapidity of the vibrations producing it. In music there are two kinds of pitch, *absolute pitch*, which is the position of a tone considered in reference to the whole range of musical tones, and *relative pitch*, which is its position as compared with some other single tone. In ascertaining the relative pitch of a tone, C is considered the standard or starting tone, and the pitch of the tone in question is found by progressing from C either by skips of perfect fifths (quints) or by skips of major thirds (tierces). Tones determined by the former method are called *quint tones*, those found by the latter *terce tones*. Relative pitch is, however, virtually never used except for scientific purposes, since the difference in pitch between every tierce tone and its corresponding quint must be carefully calculated. For ordinary purposes the musical scale is divided into a series of octaves, to represent the absolute pitch of the notes. The absolute pitch of any tone is dependent upon the number of vibrations taking place in a second. Each musical sound is produced by a series of vibrations recurring on the ear at precisely equal intervals; the greater the number of vibrations in a given time the more acute or higher is the pitch. In stringed instruments the pitch is de-

pendent upon the length, thickness, and degree of tension of the strings; the shorter and thinner a string the greater its tension and the higher the pitch of the note. In wind instruments, where the notes are produced by the vibration of a column of air, the pitch is dependent upon the length of the column set in motion; the shorter the column of air the higher the pitch becomes. The lowest tone used in music (C⁴) is given by the largest pipes of modern organs and has $16\frac{1}{2}$ vibrations per second; but this tone is so unmusical that it is used only in conjunction with its overtones. The practicable range of musical tones is from C³ (32 vibrations a second) to c⁴ (4096 vibrations a second). The note c⁴ is the basis of modern pitch, and the history of pitch is a chronicle of the variations in the number of vibrations a second that have been assigned to that note; for, strange to say, there is no absolute standard of pitch. We have no record of what pitch was used early in the history of modern music, but at the time of Guido d'Arezzo (q.v.) the treble c⁴ seems to have had somewhere near 500 vibrations a second. Our first exact idea of pitch is gained from the sizes of organ pipes that were in use in the sixteenth century, and from these we find that it differed considerably according to localities. Different pitches were also used for secular and sacred music. Early in the seventeenth century, however, a "mean" pitch was introduced, and for about two centuries this was an approximately standard pitch, since c⁴ varied during that time only from 498 to 515 vibrations a second. This is the so-called *classic pitch*, for it was in this period that the great masters of music lived. But with the growth of the orchestra and the increased importance of wind instruments, the pitch was gradually raised in order to obtain more sonorous effects; and various efforts were made to counterbalance the difficulties involved by a varying scale of pitch. In 1834 a congress of physicists at Stuttgart adopted *Scheubler's pitch* (true c⁴-528). In 1859 a French commission of musicians and scientists reported in favor of c⁴-522. This is the widely used *French pitch*. In 1887 it was formally adopted by the Vienna Congress and is now often called *International pitch*. *Philosophical pitch* (c⁴-512) is used considerably in theoretical calculations. *Concert pitch* was a high pitch of about c⁴-540, much used in concert and operatic work during the middle of the nineteenth century. Consult A. J. Ellis, *The History of Musical Pitch* (London, 1880); Widogast Iring, *Die reine Stimmung in der Musik* (Leipzig, 1908). See ACOUSTICS; MUSIC.

PITCH. See COAL TAR; NAVAL STORES; TAR.

PITCH-BLENDE. The common name for the mineral uraninite (q.v.).

PITCH'ER, MOLLY, or MOLL (c.1744-1823). A semihistorical personage who is said to have taken the place of her husband, who was shot, as an artilleryman at the battle of Monmouth and to have saved his gun from capture by the British soldiers. Many legends have grown up about her name, and it is alleged that she received from General Washington a commission as a sergeant.

PITCHER, THOMAS GAMBLE (1824-95). An American soldier, born at Rockport, Ind. He graduated at West Point in 1845. During the Mexican War he won the brevet of first lieutenant. He was promoted captain in 1858 and

during the Civil War participated in the defense of Harper's Ferry (June, 1862) and the Virginia campaign until the battle of Cedar Mountain (Aug. 9, 1862), where he was severely wounded. He was then brevetted major in the regular army and three months later was commissioned brigadier general of volunteers, but saw no further active service. On March 13, 1865, he was brevetted lieutenant colonel, colonel, and brigadier general in the regular army, and on July 28, 1866, was commissioned colonel of the Forty-fourth Infantry. From 1866 to 1870 he was superintendent of the United States Military Academy, and from 1870 until 1877 was governor of the Soldiers Home near Washington. The next year he retired from the service and from 1880 until 1887 was superintendent of the New York Soldiers and Sailors Home.

PITCHER, ZINA (1797-1872). An American physician, born in Washington Co., N. Y. He graduated M.D. from Middlebury College in 1822 and entered the army as assistant surgeon. For 15 years he was a member of the medical corps, being appointed surgeon and president of the Army Medical Board in 1835. After his resignation he settled in Detroit, where he practiced until his death. Pitcher was regent of the University of Detroit, mayor of Detroit (1840, 1841, 1843), president of the Michigan State Medical Society (1855-56), and president of the American Medical Association (1856). During his service as army surgeon having had occasion to study the habits of the Indians, their diseases and the treatment they employed, he wrote on these as well as on other subjects. Pitcher was editor of the *Peninsular Medical Journal* in 1855, 1856, and 1858.

PITCHER PLANT. See cut in article CARNIVOROUS PLANTS; NEPENTHES; SARRACENIA.

PITCH PINE. See PINE, and Plate of PINES.

PITCH/STONE'. An igneous rock of glassy or lithoidal texture, rich in contained water. To this abundance of water in their composition pitchstones owe their lustre, from which they receive their name. The term "pitchstone" is not used to indicate any particular composition of rock, but rather to designate a texture that may occur with rocks of any chemical composition, though it is developed in larger masses in the case of magmas of siliceous composition. Pitchstone differs from obsidian in containing much water, while obsidian (q.v.) is nearly or quite water-free. The most remarkable pitchstones occur upon the island of Arran, Hebrides, and near Meissen, Saxony.

PITCH/URIM BEAN. The seed of a tropical tree. See GREENHEART.

PITESCI, pi-tyesht/yi. A town of Rumania, on the main railroad, 65 miles northwest of Bucharest (Map: Balkan Peninsula, E 2). It has some trade. Pop., 1899, 15,570.

PITH (AS. *pīpa*, pith). The central cylinder of soft tissue (parenchyma) inclosed by the woody cylinder of vascular plants (pteridophytes and spermatophytes). It frequently dies, decays, and leaves the stems hollow, as in the elder. The two types of vascular cylinder are distinguished by the presence or absence of pith, the solid cylinder (without pith) being called a protosteles and the hollow cylinder (with pith) being called a siphonosteles. Siphonosteles are characteristic of gymnosperms and dicotyledons.

PITH/ECANTHROPUS. See MAN, SCIENCE OF, *Ancient Types*.

PITHOM. One of the store cities which, according to Ex. i. 11, were built by the Israelites during the Egyptian bondage. Naville, who conducted excavations in the Eastern Delta in 1883 for the Egyptian Exploration Fund, identified it with the Egyptian city of Per-Tum (abode of Tum) (Coptic Pethôm), whose site is occupied by the mound of Tell el Maskhutah (hill of the statue), so called from a sculpture found there representing Ramses II standing between the gods Re-Harmachis and Tum. It is situated in the Wadi Tûmilât, about 12 miles from Ismaïlia. Pithom seems to have been built by Ramses II to serve as a base of supplies for his armies operating in Asia, and was strongly fortified. Naville found there the remains of a great quadrangular wall of brick inclosing a space of about 55,000 square yards, within which were the ruins of a temple and a number of chambers constructed for the storage of grain. In later times, especially under the Ptolemies, the city was a place of considerable importance, and it was still in existence at a late date under the Roman Empire. By the Greeks it was called Heroôpolis. Scholars are not yet agreed as to whether the story of the building of Pithom and Raames by the Israelites has a foundation in actual historic fact. According to biblical chronology Moses was born 1576 B.C. It must then have been before this time that the King, who knew not Joseph and massacred the Hebrews' children, forced the Israelites to build the store cities. But Ramses II, after whom one of them is named and who built the other as well, reigned c.1310-1244. It is not impossible, however, that Hebrews living in Goshen (q.v.) were forced to assist in the building of Pithom by Ramses II centuries after the invasion of Syria. (See JEWS.) Consult H. N. Naville, *The Store-City of Pithom and the Route of the Exodus*, Memoir I of the Egyptian Exploration Fund (3d ed., London, 1888), and W. Max Müller, in *Encyclopædia Biblica* (New York, 1902).

PITH RAY. See MEDULLARY RAY.

PIT/KIN, TIMOTHY (1768-1847). An American lawyer, politician, and historian. He was born in Farmington, Conn., graduated at Yale College in 1785, studied law, and was admitted to the bar. He was for five years Speaker of the Lower House of the State Legislature and was a Federalist member of Congress from 1805 to 1819. (See FEDERALISTS.) He is remembered, however, chiefly as the author of *A Statistical View of the Commerce of the United States of America* (1816) and a *Political and Civil History of the United States from 1763 to the Close of Washington's Administration* (2 vols., 1828), both of which are written with great care and, though now largely superseded by other works, are still frequently consulted by students of American history.

PIT/MAN, BENN (1822-1910). A British-American author of phonographic works and a wood carver. He was born at Trowbridge, Wiltshire, England, the younger brother of Isaac Pitman (q.v.), came to the United States in 1853, and settled in Cincinnati, Ohio, where he founded the Phonographic Institute. He invented the electro process of relief engraving, and in 1873 became connected with the Cincinnati School of Design as teacher of descriptive art, especially of wood carving. In this

latter field he introduced what has since become known as the Pitman school of wood carving, which provides for the treatment of naturalistic designs and admits of beautiful effects. His influence as an artist was considerable throughout the middle West. He is the author of numerous works on phonography, of a *Plea for American Decorative Art* (1895) and a *Life of Sir Isaac Pitman* (1902).

PITMAN, SIR ISAAC (1813-97). The inventor of the Pitman system of phonography. He was born at Trowbridge, Wiltshire, England, was educated at the normal college of the British and Foreign School Society of London, in 1832 began to teach a school at Barton-on-Humber, Lincolnshire, and was afterward master of several other schools. In 1837 he published *Stenographic Sound-hand*, an exposition of the phonographic method, to the improvement and diffusion of which he directed every effort. When the English government offered a prize of £200 for the best method of collecting the pence for prepaid letters, Pitman submitted a proposal to collect the postage by means of stamps such as are now used everywhere. He pointed out that, besides the advantage to the government, the public would find it convenient to send small amounts of money in this way. In 1842 he established the weekly *Phonographic Journal*, afterward named the *Phonetic Journal*, which he edited for more than 50 years. Pitman issued many pamphlets advocating radical reform in English spelling. He was knighted in 1894. Consult T. A. Reed, *Biography of Isaac Pitman* (New York, 1890), B. Pitman, *Life of Sir Isaac Pitman* (ib., 1902), and Alfred Baker, *Life of Sir Isaac Pitman* (Centenary ed., London, 1913). For a description of his system, see **SHORTHAND**.

PITNEY, MAHLON (1858-). An American jurist, son of Vice Chancellor H. C. Pitney, born at Morristown, N. J. He was educated at Princeton (A.B., 1879; A.M., 1882), and, admitted to the bar in 1882, practiced at Morristown. As a Republican he was elected to Congress in 1894 and reelected in 1896. Leaving Congress to become a leader in State politics, he was elected to the State Senate in 1898, serving as president of that body in 1901. From 1901 to 1908 he was associate justice of the New Jersey Supreme Court, and thereafter until 1912 he was chancellor, the highest judicial position in the State. In the latter year he was appointed by President Taft to the United States Supreme Court as the successor of Justice Harlan. He became known as one of the more conservative interpreters of the Constitution.

PITO, pé'tó. See **CHICA**.

PITOMETER. An instrument for determining the flow of a liquid in a closed channel or pipe by the measurement of its velocity. This self-registering and automatic instrument was developed from the tubes devised in 1732 by the French hydraulic engineer Pitot. He used an L-shaped tube, the long arm of which stands vertically in the liquid, while a very short or horizontal arm terminates in an orifice. As used for measuring the flow of water in mains under pressure one Pitot tube is held with its orifice turned towards the approaching current, while the orifice of the other tube points towards the receding flow. In the former the water flowing in causes the level to rise above that outside, while in the tube the short arm of which points towards the direction of the current there will be a corresponding fall. The

velocity is obtained by the formula $V = c\sqrt{2gh}$, where V is the velocity, c a constant or factor that has to be determined by experiment, g the accelerating force of gravity, and h the height of water in the tube.

From simple Pitot tubes D'Arcy and other hydraulic engineers evolved a series of instruments for current measurement in open channels, and from similar devices employed advantageously to study the flow of water in pipes the modern pitometer has been developed. In this the tubes are mounted on a rod which can be inserted in the water main under investigation through an ordinary 1-inch standard corporation cock without disturbing the flow of water or producing waste. A photographic device is used to record the change of level in the tube.

The pitometer enables the observer to determine the velocity at any point in a water main; and by determining this quantity for a series of concentric rings, the average velocity for the entire flow can be computed, and after certain computations are made tables can be evolved that will give a method of measuring the flow in the pipe at any and all times, correct within 2 per cent. This enables water engineers to investigate the conditions under which a distribution system is operated, and has been the means of saving many thousands of gallons of water by detecting not only illicit and irregular consumption, but underground leaks, which naturally are hidden by the surrounding soil and pavements.

Consult: American Society of Civil Engineers, *Transactions*, vol. xlvii (New York, 1902), American Society of Mechanical Engineers, *Transactions*, vol. xxv (ib., 1904); E. S. Cole, in *Technology Quarterly*, vol. xx (Boston, 1907).

PITONI, pé-tó'né, GIUSEPPE OTTAVIO (1657-1743). A composer of the Roman school, born at Rieti. He was a pupil of the famous Pompeo Natale at Rome, and afterward studied counterpoint under Foggia. Throughout his life he was connected in various musical capacities with most of the important churches of Italy, and at the time of his death was church *maestro* of San Marco, Rome. Most of his compositions have remained in manuscript and have been carefully treasured by the churches to which they belong. During his lifetime only one book of motets (1697) was printed. One of his most famous compositions is a *Dixit* arranged for 16 parts, or four choirs, which is sung annually during Holy Week in St. Peter's, Rome. He died in Rome.

PITRÉ, pé'trá', GIUSEPPE (1843-1916). An Italian folklore scholar of Palermo, a great authority on the antiquities, traditions, dialects, and national songs of Sicily. He was one of the founders of the *Nuove Effemeridi Siciliane* (1868) and of the *Archivio per lo studio delle tradizioni popolari*. His great work is the *Biblioteca delle tradizioni popolari siciliane* (19 vols., 1870-95). In addition he published *Curiosità popolari tradizionali* (10 vols., 1885-91) and *Bibliografia delle tradizioni popolari d'Italia* (1894).

PITRI, pit'ré (Skt. *pitṛ*, father). A term in Hindu religion applied to three classes of divine beings. In the Rig-Veda the pitris are the souls of the righteous dead who dwell in paradise, or the third heaven, with Yama (q.v.), and to whom sacred balls of rice and flour together with water are duly offered. (See **SRADDHA**.) In the Atharva-Veda they are divided into higher

and lower classes, the older manes being in general the more venerated and blessed. After the Vedic period the pitris lose their importance as distinct objects of cult, although sacrifices are still offered to them in India. In its second usage the term is applied to the ten Prajapatis, or progenitors of mankind. (See PRAJAPATI.) In the later Hindu period, however, the pitris denoted a much larger class of semidivine beings who taught the gods the rituals of expiation. Manu (q.v.) enumerates various classes of pitris—those who were the ancestors of the gods, those who were the ancestors of the demons, and those from whom the four castes proceeded. The Puranas divided the manes generally into seven classes, three of which are without form, or composed of intellectual, not elementary, substance, and assume what forms they please, while the four other classes are corporeal. Consult L. D. Barnett, *Antiquities of India* (London, 1913).

PIT RIVER INDIANS. A group of small tribes of Shastan stock, occupying the volcanic mountainous region along Pit River, a head stream of the Sacramento, in northeastern California. From their custom, not known among other California tribes, of digging deep pitfalls for trapping deer, the river is said to obtain its name. The pitfalls, which were dug along deer trails and at watering places on the river, caused so many losses of cattle to the early settlers that the Indians were finally compelled to abandon the practice. See SHASTAN STOCK.

PITSCOTTIE, ROBERT LINDSAY OF (c.1500–c.65). A Scottish chronicler, born at Pitscottie, Ceres Parish, Fife. Connected with the noble family of Lindsays, he was a landowner in his native place, and is remembered chiefly for his *Chronicles of Scotland* (first published 1728), which cover a little-known period—from the death of James I to that of James III. If not entirely accurate, they are highly interesting in their picturesqueness of style and dialect and in the description of people and events. Sir Walter Scott in *Marmion* (the vision that appeared to James I before his march to Flodden) and Mrs. Oliphant in *Royal Edinburgh* (1891) are indebted to Pitscottie's *History*. A good edition of the work just mentioned was prepared by G. Dalrymple in two volumes (1814).

PITT, THOMAS (1653–1726), known as "Diamond Pitt." See PITT DIAMOND.

PITT, WILLIAM, first EARL OF CHATHAM (1708–78). An English statesman, often referred to as the Elder Pitt to distinguish him from his son of the same name. He was born in Westminster, Nov. 15, 1708, and was educated at Eton and at Trinity College, Oxford, but never took a degree, for he was afflicted with gout from an early age, and was advised to travel, which he did for a short time. Nevertheless the disease never left him and throughout life it remained a very serious hindrance. In 1731 he became a cornet in the army and in 1735 entered Parliament for Old Sarum, which was a typical example of the rotten boroughs. Soon after entering Parliament he was dismissed from the army for supporting Frederick, Prince of Wales, in his course of opposition to King George II, and his biting satire made him very obnoxious also to the powerful minister, Robert Walpole. Almost from the very beginning Pitt was a power among the Commons on account of his oratorical abilities, and he contributed much to bringing about the downfall of Walpole in

1742. Thereafter he opposed the foreign policy of Carteret, especially the practice of paying subsidies to the continental Powers. His policy became very popular among the people; the Duchess of Marlborough left him in 1744 a legacy of £10,000, and in 1765 Sir William Pynsent, an eccentric gentleman, struck with admiration for Pitt's patriotism, left him his whole estate, worth between £3000 and £4000 a year. Late in 1744 some of Pitt's associates obtained seats in the cabinet of Pelham, but the King had not yet forgiven Pitt. In 1746 the government resigned, but shortly resumed power, and Pitt was appointed joint Vice Treasurer of Ireland, and in the same year he obtained the lucrative office of paymaster general of the forces and became a member of the Privy Council. At this time he received great praise for declining the special emoluments which usually went with the office of paymaster general. In 1755, when Henry Fox (afterward Lord Holland) was made Secretary of State, Pitt vigorously opposed the foreign policy of the Newcastle cabinet, and as a consequence he was dismissed from office. Meanwhile the Seven Years' War (q.v.) had begun, and though Frederick the Great (q.v.) was gaining victories on the Continent, the English campaigns in America and elsewhere were unsuccessful. Hence in 1756 the King had to call upon Pitt, who had become the popular idol, to carry on the government. A new cabinet was formed, of which the Duke of Devonshire was the nominal Prime Minister, but all real power was vested in Pitt. The latter immediately began vigorous measures to carry on the war, but the King did not give him loyal support and finally dismissed him (April 6, 1757). He had, however, to recall him almost immediately in response to the demands of the nation, and Pitt was given full control of foreign and military affairs.

Pitt's war policy was characterized by unusual vigor and sagacity. French armies were defeated in India, Africa, and Canada, and on the Rhine, and French fleets disappeared from the seas. Pitt was virtually absolute ruler of Britain, and the populace bestowed on him the title of the Great Commoner. A change came, however, with the accession of George III in 1760. Pitt was forced to take Lord Bute into the cabinet, and finally was compelled to resign (Oct. 5, 1761). As some recompense for his important services Pitt received a pension of £3000 a year, and his wife, sister of George Grenville (q.v.), received the title of Baroness Chatham. Until 1766 Pitt remained out of office, occasionally employing his eloquence to defeat obnoxious measures of the government, and he opposed vigorously the various acts to tax the American colonists. On July 30, 1766, Pitt succeeded in forming a new ministry to succeed the Rockingham cabinet, and, as his health was very poor, he took the sinecure office of Privy Seal and was created Viscount Pitt and Earl of Chatham. His acceptance of the peerage was very unpopular, and he lost considerable influence also because his impassioned eloquence was unable to move so small a body of men as were accustomed to attend the House of Lords. Impaired health prevented Chatham from taking an active part in the ministry, of which he was nominally the head, and he resigned on Oct. 14, 1768, never to hold office again.

Chatham, however, did not cease to take an

interest in public affairs. He spoke strongly against the arbitrary and harsh policy of the government of Lord North towards the American colonies, and did his utmost to procure an amicable settlement of the differences, declaring that "England had no right under heaven to tax the colonists." But when America entered into a treaty with France and it was proposed to remove the ministers and make peace on any terms, Chatham, though in a dying state, appeared in the House of Lords and in a powerful address protested against the disruption of the Empire and the implied prostration of Great Britain before France. It was the orator's last effort; exhausted by speaking, on rising again to reply to a query addressed to him, he suddenly fell back into the arms of his friends. He died a few days later (May 11, 1778). He was honored with a public funeral in Westminster Abbey, where a statue was erected to his memory at the public expense. In addition the government gave £20,000 to pay his debts and conferred a pension of £4000 a year on his descendants.

Bibliography. The *Correspondence of Lord Chatham*, edited by Taylor and Pringle (4 vols., London, 1838-40); Francis Thackeray, *History of . . . William Pitt, Earl of Chatham* (2 vols., ib., 1827); W. E. H. Lecky, *History of England in the Eighteenth Century* (7 vols., ib., 1892-93); Walter Bagehot, *Biographical Studies* (ib., 1899); A. S. McDowall, *Chatham* (ib., 1903); Frederic Harrison, *Chatham* (New York, 1905); *Correspondence of William Pitt . . . with Colonial Governors and Military and Naval Commissioners in America*, edited by G. S. Kimball (2 vols., ib., 1906); Albert von Ruville, *William Pitt, Earl of Chatham*, English translation by H. G. Chayter (3 vols., ib., 1907); Lord Rosebery, *Lord Chatham: His Early Life and Connections* (ib., 1910); D. A. Winstanley, *Lord Chatham and the Whig Opposition* (Cambridge, 1912); K. A. Esdaile (comp.), *Walpole and Chatham*, in "Bell's English History Source Books," vol. xi (London, 1912); Basil Williams, *The Life of William Pitt, Earl of Chatham* (2 vols., New York, 1913); T. B. Macaulay, *Two Essays on William Pitt* (new ed., Oxford, 1913).

PITT, WILLIAM (1759-1806). An English statesman, often referred to as the Younger Pitt to distinguish him from his father, William Pitt, first Earl of Chatham. He was born May 28, 1759, on his father's estate at Hayes. His mother was a sister of the well-known statesman, George Grenville (q.v.). Pitt, on account of his delicate health, was educated at first at home, but when 14 years of age he was matriculated at Pembroke Hall, Cambridge, where he developed a passion for mathematics and the classics of Greece and Rome, and was graduated in 1776, receiving the degree of M.A. He then studied law at Lincoln's Inn and in 1780 was admitted to the bar. In the same year he was elected to Parliament from Appleby, taking his seat on Jan. 23, 1781. He immediately joined the party that had followed his father, and hence was in opposition to the government of Lord North. His maiden speech made a favorable impression; and when in 1782 Rockingham formed a new administration, a well-paying subordinate position, the vice-treasurership of Ireland, was offered to Pitt, but, though poor, he declined it. He had decided that he would accept nothing except a cabinet office.

On May 7, 1782, Pitt made his first motion for

a reform in the representation to Parliament. The motion was lost by a narrow margin, the vote being 161 against 141. The reformers did not make so good a showing again until 1833. Three months after his accession to office Rockingham died, and Lord Shelburne became Prime Minister, while Pitt, though only 23 years of age, became Chancellor of the Exchequer. The cabinet was met by a formidable coalition led by Charles James Fox (q.v.) and Lord North, and in 1783 Shelburne resigned. George III offered Pitt the premiership, but he declined, as he was not certain of the consistent support of the dominant factors in Parliament. The result was a coalition ministry under the Duke of Portland, in which Fox and North were the leaders. Pitt on May 7, 1783, again brought forward the question of parliamentary reform, but, though his plan this time was definite and well-ordered, the motion was lost by 293 to 149.

After Parliament had been prorogued Pitt visited the Continent and was well received. On Dec. 19, 1783, the coalition ministry was dismissed after the defeat of a bill in the House of Lords which aimed to transfer the government of India to Parliament. Thereupon Pitt assumed the premiership in the face of a powerful opposition in the House of Commons. His position was desperate. The House of Commons resented the interference of the King, whose action was of doubtful constitutionality. Between Dec. 17, 1783, and March 8, 1784, Pitt was defeated in 16 divisions. The only recourse was either to resign or to order a new election; but Pitt postponed the election as long as possible. When at last he saw that the current of popular opinion had set in his favor, he dissolved Parliament, and the election proved to be a triumph for his administration, he himself being returned for the University of Cambridge, for which he sat for the rest of his life.

Pitt was 25 years old at this time and was the most powerful subject that England had had for generations. He ruled absolutely over the cabinet, and was at once the favorite of the sovereign, of Parliament, and of the nation. When Parliament met Pitt's first work was the ordering of the finances, for enormous deficits had existed for many years. In this he was very successful. In 1784 he established a new constitution for the East India Company, the Board of Control being instituted. In 1785 he introduced his third reform bill, providing for the purchase of 72 rotten boroughs, but the bill failed to pass, and the outbreak of the French Revolution soon afterward put an end for many years to serious attempts at parliamentary reform. Pitt was the first British statesman to attempt to put into practice the principles enunciated in 1776 by Adam Smith. His bill, however, providing for free trade between England and Ireland failed in 1785. In the following year Pitt was successful in negotiating a liberal commercial treaty with France. In 1792 he supported Wilberforce's proposal for the abolition of the slave trade, but he could not carry the House of Commons with him. In the war between France on the one side and Austria and Prussia on the other he maintained strict neutrality so long as he was able, but the Paris massacres of September, 1792, and the execution of Louis XVI in January, 1793, so outraged the feelings of the English people that peace could no longer be maintained. In February, 1793, the French Convention declared war against Eng-

nd. While the English were successful on the a, Pitt opposed the French on land principally means of heavy subsidies to his continental allies, thus inaugurating the system which was followed throughout the Napoleonic wars. In a persistent enmity towards Napoleon he was opposed throughout by his great rival, Fox. While the financial difficulties caused by the outbreak of the war with France were at their height, Irish affairs also became very perplexing. Pitt desired to relieve the Catholics of the disabilities under which they were laboring, but George III compelled him to withdraw all such schemes. In 1800-01 a parliamentary union with Ireland was effected, but it by no means allayed discontent. In order to relieve some of the financial difficulties of the nation, Pitt created a sinking fund, which at considerable cost maintained the credit of the government. Meanwhile Napoleon had defeated Austria in Italy, while Prussia became neutral, so that England was left to struggle with France alone. In 1801 Pitt resigned because the King refused to accept his Catholic emancipation measures. He loyally supported the new ministry of Addington in its attempt to make a permanent peace, which resulted in the Treaty of Amiens in 1802. When Pitt was no longer able conscientiously to aid Addington he withdrew from active participation in affairs. His health was poor and his finances were in disorder. On May 16, 1803, war was declared by England against France, and Pitt at once reappeared to aid his country. He criticized the weakness of the government, and on May 10, 1804, again became Prime Minister. Pitt's vigorous measures resulted in the third great coalition against France, but, though he victory of Trafalgar cheered him, the defeat of Austria and her ally, Russia, at Austerlitz on Dec 2, 1805, proved his deathblow. Shortly before he died he uttered the prophetic words, so well known: "Roll up the map of Europe; it will not be wanted these 10 years." He died Jan 23, 1806, and was buried on February 22 in Westminster Abbey. His work did much to bring about the ultimate downfall of Napoleon, and in many respects Pitt may be considered England's greatest Prime Minister.

Bibliography. Pitt's *Speeches in the House of Commons* have been published in three volumes (London, 1817); while an account of his parliamentary career is to be found in the *Parliamentary History* (36 vols., ib., 1803-10) and in Hansard, *Parliamentary Debates*. Consult also: Earl Stanhope, *Life of William Pitt* (2d ed., London, 1862), which is the best work on this subject; T. E. May, *Constitutional History of England* (ib., 1863-65); Lord Rosebery, *William Pitt in "Twelve English Statesmen Series"* (ib., 1891); W. E. H. Lecky, *History of England in the Eighteenth Century* (7 vols, ib., 1892-93); A. T. Mahan, *Influence of Sea Power upon the French Revolution* (Boston, 1893); Lord Ashbourne, *Pitt: Some Chapters of his Life and Times* (New York, 1898); William Hunt, *The History of England from the Accession of George III to the Close of Pitt's First Administration* (ib., 1905); Charles Whibley, *William Pitt* (Edinburgh, 1906); T. B. Macaulay, in *Critical and Historical Essays*, vol. ii, in Everyman's Library (New York, 1909); J. H. Rose, *William Pitt and the National Revival* (London, 1911); id., *Pitt and Napoleon* (ib., 1912); id., *William Pitt and the Great War* (New York, 1915).

PITT, WILLIAM (1773-1857). See AMHERST, EARL OF.

PITT, WILLIAM. See LENNOX, WILLIAM PITT, LORD.

PITTA (from Telugu *pitta*, a small bird). One of a group of passerine birds, known as *brèves* by the French. The characteristics are brilliant plumage, a very short tail, long legs, with scutellated tarsi, and, generally, a strong bill. They were long supposed to be allied to the thrushes and several were called ground thrushes and ant thrushes in the books; but they are now understood to be more nearly related to the American flycatchers. About 60 species have been described, inhabiting the Malay archipelago, China, India, and Australia, while one species occurs in western Africa. Their habits are terrestrial chiefly, and they live amid rocks and brush, hunting mollusks and insects among the fallen leaves, or digging for worms and ants. They are shy, quick, and not so often seen as their plaintive, whistling notes are heard. All are small birds of gaudy plumage, which shows such colors as scarlet, blue, and green. They make their nests on the ground and lay spotted eggs. Consult: Newton, *Dictionary of Birds* (London, 1893); A. H. Evans, "Birds," in *Cambridge Natural History*, vol. ix (New York, 1900); and authorities on Indian, Malayan, and Australian ornithology. See Plate of COINGAS.

PITTACUS (Lat., from Gk. Πιττακός, *Pittakos*) (c 652-569 B.C.). One of the Seven Wise Men of Greece. He was born at Mytilene in the island of Lesbos and was a son of Hyrrhadus, a Thracian, and a Mytilenean mother of good family. He is celebrated as a soldier, statesman, philosopher, and poet. About 612 B.C., in conjunction with the brothers of the poet Alcæus (q.v.), he overthrew and killed Melanchrus, the despot of Mytilene. A few years later, about 606, he was engaged, at the head of the Mytilenean forces, in fighting the Athenians for the possession of the coast of the Troad near Sigeum. Though neither side was decisively victorious, Pittacus slew with his own hand the Athenian commander Phryno. For his services he would take but a small piece of land, which he dedicated to sacred uses; at a later time it was known as the Pittacean Land. On the banishment of Alcæus, who was the leader of the aristocratic party, Pittacus, as being the most prominent democrat in the city, was in 589 chosen *asymnetes* (ἀσυνμήτης), or ruler with absolute power, for 10 years. As dictator he reestablished security and peace in the state and enacted various laws. Of his poetry only a few lines have been preserved by Diogenes Laertius (q.v.).

PITT DIAMOND. A famous stone, originally weighing 410 carats, now reduced to 136¾ carats, and considered the most brilliant and perfect diamond in existence, being valued at nearly \$2,500,000. It was found in the Partael mines of India, and was sold for about \$100,000 by a sailor to Thomas Pitt, Governor of Fort St. George and grandfather of the first Earl of Chatham. In 1717 it was sold to the Duke of Orleans and hence received the name of the Regent diamond. One account says the Duke paid \$400,000, another that the price paid was \$675,000. At the time of the French Revolution it was pledged in the hands of a Berlin merchant; and was afterward set in the hilt of Napoleon's sword. It is now owned by the French government. See Plate of DIAMONDS.

PITTI PALACE. A celebrated Florentine palace of the early Renaissance, now used as a royal residence. Excepting the Vatican it is the largest palace in Italy, and one of the most imposing in the world. A typical Florentine palace of the fifteenth century, part fortress, part residence, it became a model for such structures. The imposing character of the façade is due to the use of rough-hewn stone, giving a massive effect, and to the simple and harmonious proportions of the three stories. This effect is heightened by its situation upon a hill on the left bank of the Arno; behind it are the beautiful Boboli Gardens.

The palace was designed in 1440 by Brunelleschi for Luca Pitti, then chief magistrate of the Republic. Brunelleschi lived to complete the first story, and after Luca's fall the building was not resumed until the palace was purchased by the ducal family and made their residence. In 1568 Ammanati was employed to make a new design to replace Brunelleschi's lost plan. To him is due the celebrated court of the palace—a rather unfortunate attempt to use rustic work with pilasters. The wings of the façade date from 1620, being an addition to Brunelleschi's more simple plan, and the building was not completed till 1839.

Within the palace, and open to the general public, is one of the finest collections of paintings in the world, numbering but 500 specimens, nearly all of them masterpieces. It is especially rich in Italian masters of the sixteenth century, and possesses fine examples by Andrea del Sarto, Giorgione, Titian, Tintoretto, besides six of the very best Raphaels, including the world-famous Madonnas of the Grand Duke and of the Chair and the portraits of Julius I and Leo X. Other European schools are represented by Dürer, Rembrandt, Rubens, Van Dyck, Murillo, and Velazquez. Consult J. de W. Addison, *Art of the Pitti Palace* (Boston, 1904), and Corrado Ricci, *Les musées de Florence: Palais Pitti et Académie* (Paris, 1911).

PITTMAN, KEY (1872–). An American legislator, born at Vicksburg, Miss. He studied at the Southwestern Presbyterian University at Clarksville, Tenn., and began law practice at Seattle, Wash., in 1892. Five years later he went to Klondike, where he worked as a miner for two years, participated in the attack on the corruption of government officials, and helped (1899) to organize the government in the Nome district. In 1902 he moved to Tonopah, Nev., where he acquired an extensive mining and corporation practice. He was unsuccessful as Democratic candidate for United States Senator in 1910, but was elected by popular vote to that office in 1912, his election being confirmed by the Nevada Legislature for the unexpired term of George S. Nixon ending in 1917.

PITTON DE TOURNEFORT, JOSEPH. See TOURNEFORT, J. P. DE.

PITT-RIVERS, AUGUSTUS HENRY LANE-FOX (1827–1900). An English archaeologist. His name originally Lane-Fox, he assumed that of Pitt-Rivers in 1880 upon inheriting the estates of his great-uncle George Pitt, second Baron Rivers. He studied at the Sandhurst Military College, received a commission in 1845, and was subsequently promoted through the various grades to lieutenant general in 1882. An extensive collection of weapons and instruments which he made to illustrate the course of human invention, he presented to the University of Ox-

ford. Pitt-Rivers made extensive excavations on his own estate, which was the site of battlefields of the Britons, the Romans, and the Saxons. In 1876 he became a fellow of the Royal Society and in 1881–82 was president of the Anthropological Institute. He is author of *Excavations in Cranborne Chase* (2 vols., 1887–88); *Antique Works of Art from Benin* (1900); *Evolution of Culture and Other Essays* (1906).

PITTSBURG. A city in Crawford Co., Kans., 129 miles by rail south of Kansas City, on the Atchison, Topeka, and Santa Fe, the Missouri Pacific, the St. Louis and San Francisco, the Joplin and Pittsburg, and the Kansas City Southern railroads (Map: Kansas, H 8). It has extensive coal-mining interests, being situated in the centre of productive coal fields. There are shops of the Kansas City Southern, a foundry and machine shops, brick and sewer-pipe plants, lumber and flour mills, clay works, grain elevators, packing houses, etc. The city maintains a public library. A State normal manual training school is situated here. Settled in 1876, Pittsburg was incorporated in 1880. It has the commission form of government. The water works are owned by the city. Pop., 1900, 10,112; 1910, 14,755; 1915 (U. S. est.), 17,320.

PITTSBURGH. The county seat of Allegheny Co., Pa., situated at the confluence of the Allegheny and Monongahela rivers, which unite within the city limits to form the Ohio; 444 miles by rail west of New York, 354 miles west-northwest of Philadelphia, and 468 miles east of Chicago (Map: Pennsylvania, A 6).

The census returns of 1910 rank Pittsburgh eighth in population and fifth in commercial and industrial importance among the cities of the United States and second to Philadelphia in the State. Pittsburgh in 1915 had 27 wards, their total area aggregating 41.61 square miles. The original city lay in the peninsula formed by the two rivers. Its corporate limits spread eastwardly, resulting in separate annexations in 1837, 1847, 1868, 1874, 1895, and 1906. Twelve boroughs, in line on the south side of the Monongahela, were annexed in 1874 and the city of Allegheny (q.v.) in 1906. Many of the great industries have been established on the outskirts of the city for convenience of space and rail and river shipping facilities. The city has been growing out to them. A new residential section has grown on the South Hills, made feasible by tunnels through Mount Washington. The city owns four bridges across the Monongahela and in 1915 built a magnificent bridge across the Allegheny at the Point. Eight other bridges cross the Allegheny, but they are owned by the county.

Coal is still the main fuel for manufacturing purposes, but the abundance of natural gas, also largely used in manufacturing and the principal fuel of the homes, has made Pittsburgh a comparatively clean city except under certain atmospheric conditions. The unattractive characteristics of a manufacturing city have been slowly disappearing, and vast civic improvements have been made, especially in the cutting down of the heavy grades of important streets necessitating the razing of many blocks of old buildings and the erection of modern and attractive ones in their stead. The elevation of many streets above the flood level of the Allegheny River, the opening of the Schenley Farms for building purposes, bridges across the ravines, tunnels through the South Hills, a system of well-kept parks, new

and costly public buildings, hotels, and private residences, have all combined to make Pittsburgh a distinctly modern American city. The narrow, poorly planned streets of colonial Pittsburgh remain. Diamond Street and Oliver Avenue are the new thoroughfares. Fifth and Sixth avenues, Sixth Street (also called Federal), Wood, Market, and Smithfield streets are the principal thoroughfares. Lower Liberty Street and Penn Avenue have become streets of retail stores. Fourth Avenue continues the local Wall Street. The Bellefield, Shadyside, East Liberty, Homewood, and Squirrel Hill districts contain the most costly residences. These are found on the eastern portions of Fifth and Penn avenues, Forbes and Liberty streets, the chief thoroughfares between downtown and the East End, and on Highland, Negley, Ellsworth, and Centre avenues. The altitude of the city varies from 703 feet above sea level, at the confluence of the rivers, to 1260 feet at Herron Hill. The mean annual temperature is 53° F., 31° F. for January and 75° F. for July.

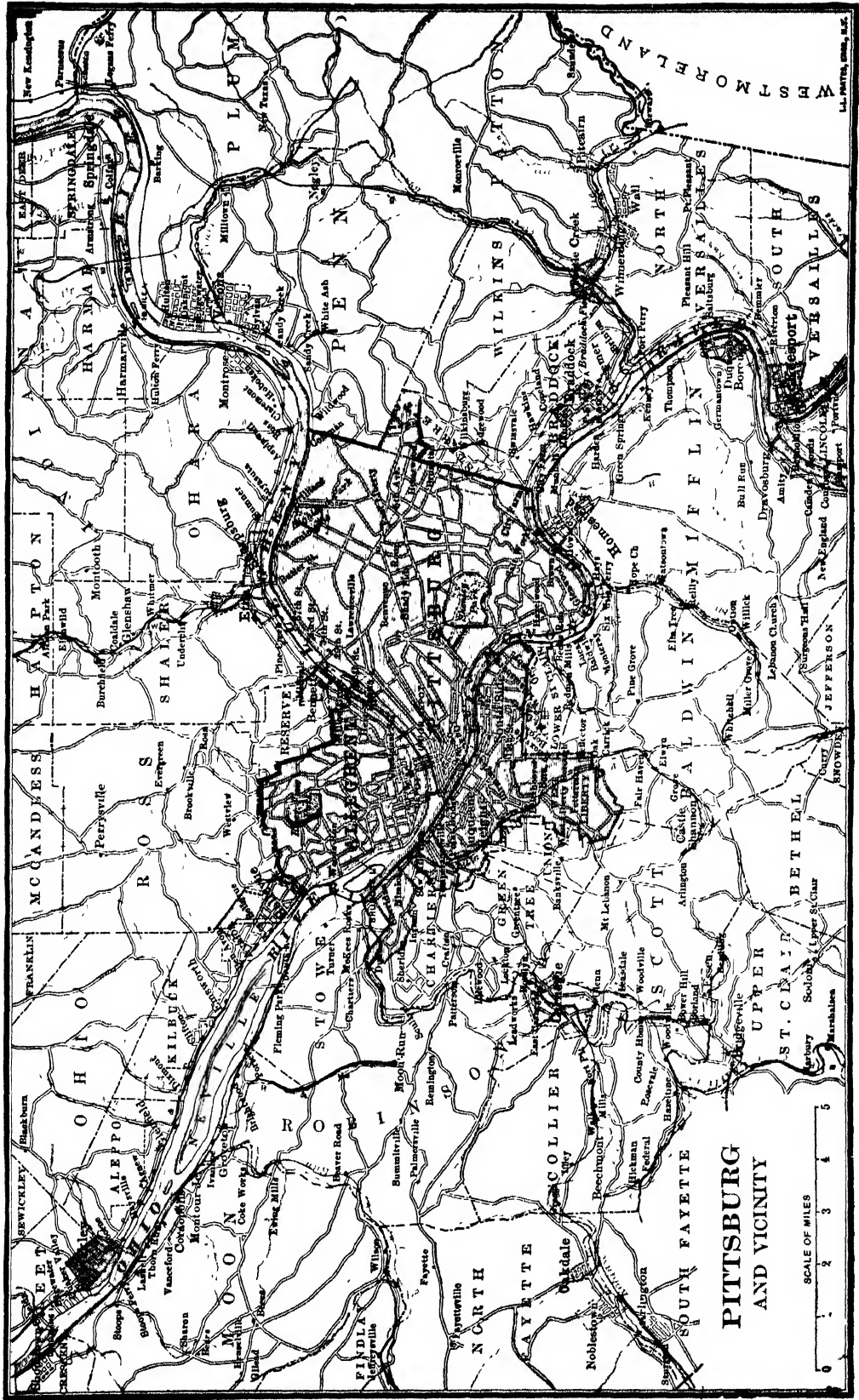
The city has 983 miles of streets, of which 542 are paved. The city's three boulevards, united, are 11½ miles long. There are 630 miles of sewer, 731 miles of water mains, and 8 reservoirs, with an aggregate capacity of 585,000,000 gallons. An extensive filtration plant (slow sand system) has been installed at Aspinwall on the Allegheny River at a cost of about \$7,000,000. The plant covers 167 acres, the sand beds 56 acres, and it has a capacity of 200,000,000 gallons daily. The entire city and suburbs are piped for natural-gas consumption, which is not only the principal domestic fuel, but has almost entirely supplanted artificial gas for light. The electric-railway system, embracing the entire city and extending to the suburbs, has a total single-track mileage of about 513, of which 208 are within the city limits.

Buildings. Among the prominent public buildings are the Allegheny Courthouse and jail, completed in 1888, occupying two blocks, facing Grant Street, with a "Bridge of Sighs" across Ross Street. An additional courthouse was being erected in 1915 on the opposite block, between Diamond Street and Fourth Avenue, at an estimated cost of \$5,000,000. In the imposing government building on Smithfield Street are the quarters of the United States courts, the collector of internal revenue, surveyor of the port, and other Federal officials. Among the many office buildings the most notable are the Henry W. Oliver (25 stories), the First National Bank (25 stories), and the Keenan (20 stories) buildings, and the Frick Arcade. The handsome Frick Building opposite the courthouse is of granite, finished throughout in white marble and mahogany. The Farmer's Deposit National Bank Building has 24 stories. There are a score or more buildings of the sky-scraper type. The Bank of Pittsburgh has an artistic home of the low type. Notable church structures are the new St. Paul's Cathedral (Roman Catholic) in Bellefield, Trinity (Protestant Episcopal), "downtown," Christ Methodist Episcopal and the Sixth United Presbyterian, "East End," St. Augustine's (Roman Catholic) in Lawrenceville, and the new synagogue of the Rodeph Shalom congregation in Oakland. The finest hotels are the new William Penn (21 stories), Fort Pitt, Schenley, and the Colonial Annex. The opening of the Schenley-estate holdings in Bellefield, known as the Schenley Farms, has given Pittsburgh a section

unique in topography and noteworthy for the character and magnificence of its architecture. Chief among the buildings on this plot are those of the University of Pittsburgh, the Soldier's Memorial of Allegheny County, the Masonic Temple, Syria Temple of the Nobles of the Mystic Shrine, the Eighteenth Regiment (National Guard) Armory, and the Pittsburgh Athletic Club.

Parks. The system of parks originated in Pittsburgh in 1890, when Mrs. Mary E. Schenley, of London, England, a native of Pittsburgh, deeded to the city 382 of her ancestral acres in the Bellefield section for the park named in her honor. Additions of 40 acres have since been made. The Carnegie Museum and Library is at the Forbes Street entrance. The park contains the Phipps Conservatory and Hall of Botany (gifts of Henry Phipps), a music pavilion, several fine bridges, bronze statues of E. M. Bigelow (termed "the Father of the Parks") and Robert Burns and a statue of Col. A. L. Hawkins, bronze memorial tablets of the Tenth Regiment (Pennsylvania) Volunteers in the Spanish-American War, a race track, and five shelter houses. Highland Park (area, 366 acres), on the high ground at the head of Highland Avenue overlooking the Allegheny River, is one of the most picturesque parks in the country. It contains three city reservoirs, several statues (the most notable that of Stephen C. Foster), the C. C. Magee Zoölogical Gardens, three shelter houses, and a band stand. The principal entrances, at Highland and Stanton avenues, are graced by handsome sculptures. There are also beautiful parks on the North Side. (See ALLEGHENY.) The William Pitt Boulevard connects Highland and Schenley parks and the Grant Boulevard, the latter with the downtown district. There are a number of smaller parks throughout the city, Arsenal, Herron Hill, Grandview, Lawrence, McKinley, and West End are the principal: McKinley the largest, with 63 acres. There are several plots for playground purposes, fully equipped, notably the Washington Grounds on the hill above the Pennsylvania Station. There are lakes in Schenley, Highland, and the West parks; golf links in Schenley, free merry-go-rounds in Schenley, Grandview, and Riverview parks, and a gymnasium and ball grounds in Washington and Lawrence parks. The total park acreage is 1328.89.

Public Institutions. Chief among the public institutions of the city are the magnificent buildings of the Carnegie Foundations, comprising the Carnegie Library and Institute. The institute has three branches—the Museum of Art, the Museum of Science, and the Carnegie Institute of Technology (q.v.). The museums are housed in the Central Library Building at Schenley Park. This building covers nearly six acres, is of the Italian Renaissance type, and was opened to the public in 1895. In 1907 it was remodeled and enlarged and has cost \$6,000,000. The endowment of the institute is \$12,264,000. The city appropriates approximately \$250,000 annually for the maintenance of the Central Library and its eight branches. Carnegie Free Library of Allegheny is a separate foundation, for which Pittsburgh makes an annual appropriation. The Central Library contains 275,202 volumes; the circulation in 1914 was 204,596. The branches contain 143,947 volumes, with a total circulation, in 1914, of 1,351,731. The Central Library Building contains a music hall,



seating 2000, where free organ recitals are given weekly, and art galleries where an international exhibition of art is held by the Carnegie Institute. Allegheny County's Soldiers Memorial known locally as Memorial Hall, one of Pittsburgh's most notable structures, was completed in 1910, at a cost to the county of \$1,700,000. It contains an auditorium, seating 2600, and a banquet room. A museum of pictures and manuscript war relics and a war library have been established. Bronze mural tablets have been erected containing the names of 20,000 soldiers and sailors furnished by Allegheny County during the Civil War. The Pittsburgh Exposition Society holds a general exposition for six weeks each autumn in its buildings on Duquesne Way, at the Point.

Hospitals and Charities. Pittsburgh has 21 hospitals and 80 charities. The largest general hospital is the Western Pennsylvania, on Friendship Avenue, the department for the insane being at Dixmont. Other hospitals are the new Homœopathic, new Elizabeth Steel Magee, St. Margaret's Memorial, St. Francis, Columbia, Mercy, Passavant's, Montefiore, Eye, Ear, and Throat, Pittsburgh, South Side, and St. Joseph's. (See ALLEGHENY.) All receive State aid except St. Margaret's and the Magee. There are also the Municipal, Municipal Tuberculosis, and the United States Marine hospitals. Among the charitable institutions are the Church Home (Protestant Episcopal), Home for Incurables, Florence Crittenton Home, Free Dispensary, St. Joseph's Protectory for Boys (Roman Catholic), Home for the Aged (Roman Catholic), St. Paul's Orphan Asylum (Roman Catholic) at Idlewood, Old Ladies' Home (United Presbyterian) at Wilkinsburg, Odd Fellows' Home for Widows and Orphans at Ben Avon, Pittsburgh Newsboys' Home and the Home of the Ladies of the Grand Army of the Republic at Hawkins. The principal cemeteries are the Allegheny, Homewood, Uniondale, and South Side (Protestant), and St. Mary's and Calvary (Roman Catholic). The smaller burying grounds are many; one of the most interesting that about Trinity Church, Sixth Avenue, where many pioneers of the community were interred, among them 24 officers of the Revolution, whose names are commemorated on a bronze tablet on the Oliver Avenue wall. Two fine settlement houses, the Sarah Heinz and the Irene Kaufman, are memorials of the wives of prominent citizens. Two tuberculosis dispensaries are maintained—one by the State, the other by private charity. The United States Bureau of Mines in 1912 established a rescue station in Pittsburgh.

Educational Institutions. Pittsburgh has a well-equipped educational system. There are 118 elementary schools, 1 normal school, and 7 high schools. In 1915 there were 2700 teachers and principals. Four new high schools and five elementary buildings were under construction in that year. The total enrollment of pupils in 1915 was 76,989. Fifty-four night schools are also maintained, with a total enrollment of 23,277 and 340 teachers. The control of the public schools is vested in a board of 15 directors, appointed by the judges of the courts of common pleas of Allegheny County for a term of five years. The appointed board makes but one tax levy, regulates all courses of study, and has entire control. Ninety-seven kindergartens are maintained, with 202 teachers and an enrollment of 6414. To the total of the school population

must be added approximately 27,000 in the parochial schools. The private educational institutions include the University of Pittsburgh (q.v.), formerly the Western University of Pennsylvania; Duquesne University, formerly the Pittsburgh College of the Holy Ghost (Roman Catholic); the Carnegie Institute of Technology (q.v.); Pennsylvania College for Women; Dilworth Hall; Academy of Our Lady of Mercy and Ursuline Academy (Roman Catholic), for girls; Shadyside and East Liberty academies, for boys; Pittsburgh Academy (coeducational); the Kindergarten College; and numerous institutes. The Duquesne University maintains departments of law and engineering. The Institution for the Blind is in Bellefield and the Institution for the Deaf and Dumb at Edgewood, a suburb.

Commerce and Industry. Pittsburgh is a port of entry, and its imports for the year ending June 30, 1915, amounted to \$1,935,703. Pittsburgh is the centre of the largest manufacturing district for steel and iron in the world. Within a radius slightly larger than that of the metropolitan district tin plate, steel cars, pipe and tubing, air brakes, coal and coke, electrical machinery, glass, pickles, white lead, and vanadium are produced on a large scale. The city's supremacy is due to its fuel supply. Coal and coke are the largest items in its enormous freight tonnage, which surpasses that of New York and is unequalled. The coal tonnage in the Pittsburgh district in 1913 was 101,000,000 tons. The railroad freight of all kinds totaled 160,444,634 tons, excluding switching and local tonnage; the water tonnage was 12,184,494 tons. The Pittsburgh district is not only the largest coal-producing district in the world, but the largest coal-consuming district as well. In 1913, a record year, 33,000,000 tons were made into coke, totaling 20,097,900 tons, and 13,495,473 tons were shipped as lake cargoes.

In 1910 the Pittsburgh metropolitan district (see section on *Population* below) had invested in manufacturing enterprises \$642,527,046, with annual products worth \$578,815,493. In the city of Pittsburgh the census of 1910 gives the number of manufacturing establishments as 1659; capital, \$283,130,000; value of manufactures, \$243,454,000; wage earners, 67,474; wages, \$39,973,000. The invested capital and output of adjoining cities and towns outside of the metropolitan district, with the district called "the greater Pittsburgh," added to this total, greatly increases these amounts. This district in 1910 produced 10,001,099 tons of pig iron, or 16 per cent of the world's output, and 30.5 per cent of the production of the United States. The city and metropolitan district produced, in 1912, 6,107,128 tons of pig iron, nearly 20 per cent of the United States output. The production of steel of all kinds in the Pittsburgh district in 1912 was 11,199,430 tons, or 36 per cent of the output of the country, 25 per cent produced in Allegheny County. Steel rails approximated 12 per cent and structural steel 37 per cent. Other finished products are wire, nails, boiler, hull, and armor plate, projectiles, angle and merchant iron, agricultural implements, stoves, engines, boilers, locomotives, sanitary supplies, and enameled ware. The diversified manufacturing, apart from the predominating industries, is vast and important. The value of the glass products in 1912 was \$39,491,000. Pittsburgh has the largest cork factory in the world. Pittsburgh

is also important in the production of finished aluminium and electrical cable for underground use. It has an annual output of over 500,000 pounds of copper. The value of these diversified industries aside from iron, steel, glass, and their correlated products, and electrical equipment reaches \$125,000,000. Peculiarly local is the manufacture of the so-called tobies or stogies. This species of cigar originated in Pittsburgh, and there are 250 manufactories in the city engaged in this business, whose annual product totals \$4,000,000.

In 1910 the census enumerated 2369 manufacturing establishments in the metropolitan district, with 20,692 salaried employees and 139,285 wage earners (average number). The United States Steel Corporation has a number of its constituent plants in Pittsburgh. The Westinghouse Air Brake Company's works, employing 3500 hands, are at Wilkferding, a suburb, and the Westinghouse Electric Company's with 13,000 at East Pittsburgh. The three steel-car plants employ 13,000. There are over 40 plants employing over 1000 hands each.

There are 22 national banks, 26 State banks, and 30 trust companies in Pittsburgh, with combined capital of \$55,626,300; surplus and undivided profits, \$95,956,634; deposits, \$430,646,460. Of these one trust company has a capital of \$1,500,000; surplus and profits, \$32,823,233; and deposits of \$58,946,515. One national bank has deposits of \$51,508,057. Most of these institutions are represented in the Pittsburgh Clearing House. The Clearing House Association is composed of 15 national banks in the city; the annual clearings total nearly \$3,000,000,000.

Transportation facilities of Pittsburgh consist of water routes of the three rivers, and 22 railroads, comprising the Pennsylvania System, New York Central lines, Baltimore and Ohio, Bessemer, the Buffalo, Rochester, and Pittsburgh, and the Wabash railroads. The most extensive freight yards are the Pitcairn on the Pennsylvania Railroad, Glenwood on the Baltimore and Ohio, McKees Rocks on the Pittsburgh and Lake Erie; Sheridan, for the Pan Handle lines; Conway, for the other Pennsylvania lines west. At Twenty-eighth Street are the yards of the Buffalo and Allegheny Valley Division, and on the North Side those of the Conemaugh and West Penn divisions. The Wabash yards are at Rook, 4 miles out. The Pennsylvania has a large passenger station at Liberty and Eleventh streets, used by all its lines. The station on the North Side, formerly Allegheny, is now called the Federal Street Station. The Baltimore and Ohio has its station at Water and Smithfield streets, used also by the Buffalo, Rochester, and Pittsburgh. The Pittsburgh and Lake Erie has a fine station at the south end of the Smithfield Street Bridge, and the Wabash an elaborate structure at Liberty and Ferry streets.

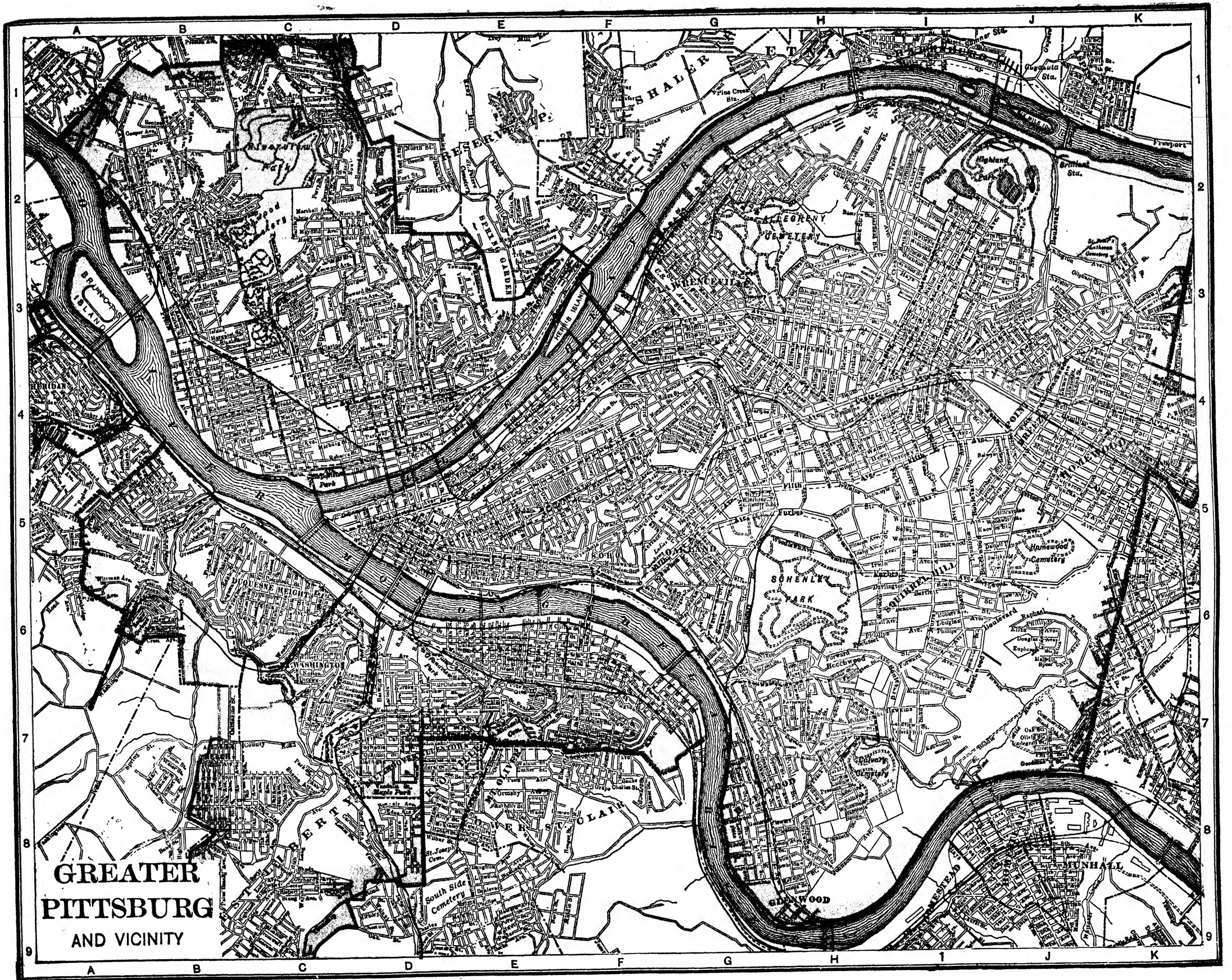
The rivers are of great importance commercially. The Monongahela (q.v.) flows north through the richest coal fields of West Virginia and southwest Pennsylvania. On its banks are many of the largest manufacturing plants of the Pittsburgh district, including those at Monessen, McKeesport, Clairton, Duquesne, Braddock, and Homestead. The Monongahela is a "slack-watered" river, with 15 locks and dams built and operated by the United States government, without tolls. The Davis Island Dam, the first of the Ohio River improvements, 5 miles below the confluence, in connection with the first dam on the

Allegheny and Number 1 on the Monongahela, forms the Pittsburgh Harbor, a Y-shaped pool nearly 7 miles long. Pittsburgh has 244 steam vessels on its marine register, their total tonnage being 33,712. The total barge tonnage is estimated in excess of 2,500,000 tons. Steamboat traffic is maintained on the Ohio River, and considerable business in lighter freights and passengers is done by packets. Such traffic on the Monongahela and rafting on the Allegheny have been discontinued.

The export trade of Pittsburgh is vast. Many manufactured products are shipped by river. Coal shipped to tidewater is mainly from mines 20 miles east of the city. Coal not available for river shipments goes west and northwest by rail to the lakes. Eight lake ports can be used, all in direct railroad communications with Pittsburgh, Ashtabula being the chief. The export tonnage in manufactured iron and steel is enormous.

Government. The government of Pittsburgh is operated under a charter (granted in 1901 and amended in 1909 and 1911) which makes the mayor the chief executive. A council of nine members legislates for the city. The mayor is elected on a nonpartisan ballot for a term of four years. He appoints all heads of departments, subject to the approval of a majority of the council. The controller is elected on a nonpartisan ballot for a term of four years. The treasurer is appointed by the mayor for the same term. The chief departments are public safety, public works, health, and public charities. Other departments are law, city treasurer, supplies, assessors, and city planning. There are eight police magistrates, appointed by the mayor, and a board of three members, likewise appointed, for the assessment of water taxes. The department of city planning is directed by an unsalaried commission of nine, appointed by the mayor, which is empowered to prepare plans, reports, and recommendations for public improvements, and to make suggestions or reports on any public improvement submitted to council. The art commission consists of the mayor, director of the department of public works, and seven others appointed by the mayor. Attached to the mayor's office are several bureaus. Police and detectives are under one head, the chief of police. The bureau of fire is under the chief engineer, who has 10 assistants. The apparatus is largely automobile in character. There were, in 1915, 62 fire companies and a water tower. The civil-service law for Pittsburgh, passed by the Legislature of Pennsylvania, is administered by a salaried board of three persons appointed by the mayor, whose term of office runs with the mayor. The law provides that not more than two members shall be adherents of the same political party. An independent fund for school teachers is under the control of the board of education.

Municipal Finances. The total assessed valuation of the city for 1915 was \$771,000,000. The gross bonded indebtedness is \$39,063,606; net debt, \$30,558,129. The limit of indebtedness fixed by law is 7 per cent of the assessed valuation. The real estate owned by the city includes the water plants, land and improvements, \$18,952,960; fire properties, \$1,545,269; police properties, \$349,546. The grand total of all buildings is \$37,212,492. The total revenues for the fiscal year ending Jan. 31, 1915, were \$16,206,952.70; total appropriated for general ex-



penditures, \$12,554,916.62. The department of public works expended \$419,694.83. The department of public safety expended \$2,089,273.45 in the two bureaus of police and fire, divided almost equally. The department of charities expended \$348,350.33. Interest paid amounted to \$1,884,819.74, and \$1,336,644.13 was applied to sinking funds. The health departments expended \$721,446.16. A system of health inspection in the schools has been established. This is called the department of child welfare. The value of school grounds is \$5,786,806.05; of school buildings, \$11,432,690.92, equipment, \$1,067,133.88.

Population. The growth of Pittsburgh and its metropolitan district has been rapid. As defined by the United States Bureau of the Census, the metropolitan district of Pittsburgh includes McKeesport, Braddock, Wilkinsburg, Homestead, Duquesne, and 20 other boroughs, all of which are communities which may be considered as intimately associated with the urban centre. In 1910 the population of the metropolitan district was 1,042,855; of Allegheny County, 1,018,463. The population of the city of Pittsburgh by periods is: 1800, 1565; 1810, 4768; 1820, 7284; 1830, 12,568; 1840, 21,115; 1850, 46,601; 1860, 49,221; 1870, 59,568; 1880, 121,799; 1890, 238,617; 1900, 321,616; 1910, 533,905; 1915 (U. S. est.), 571,984. In 1910, 393,469 were native born, 140,436 foreign born, and 191,483 of foreign or mixed parentage. The great industries of the Pittsburgh district draw this large alien population. The colored population in 1910 was 34,217.

History. Traders in Indian goods came into the upper Ohio region about 1730, and in a few years the headwaters of the Ohio became a centre of their trading operations. France and Great Britain were rival claimants to the region, and on the British side both Pennsylvania and Virginia asserted jurisdiction. Washington visited the site of Pittsburgh in 1753 and wrote in his journal: "I spent some time in viewing the rivers and land in the forks, which I think extremely well situated for a fort, as it has absolute command of both rivers." In the interest of the Ohio Company (q.v.), Captain Trent with a few Virginia militia began a fort at "the Forks" in February, 1754. This detachment was surprised (April 17) by a force of 1000 French and Indians with artillery, who compelled the Virginians to leave. The French then built Fort Duquesne. In the effort to capture this fort the strong British expedition under General Braddock met disastrous defeat (July 9, 1755), 8 miles distant, at the present town of Braddock. In 1758 General Forbes, moving from Philadelphia, led an army of 7000 against Fort Duquesne. An advance party of 800 under Major Grant attempted to surprise the garrison on September 14, but was overwhelmed and routed. The site of this engagement is marked by a bronze tablet on the courthouse. The historic hill for a century known as Grant's Hill has been gradually cut away. Forbes by November 24 was within 15 miles of the fort; the weak garrison thereupon burned the buildings, blew up the fort, and fled down the Ohio in boats. The next day Forbes occupied the place and named it Pittsburgh in honor of the British Prime Minister. A detachment under Col. Hugh Mercer built a small fort, called Fort Pitt, and garrisoned it during the winter. In 1759 General Stanwix built the second Fort Pitt, which remained until 1792. During Pontiac's

War Fort Pitt was vigorously besieged by the Indians from June 27 to Aug. 6, 1763. Colonel Bouquet, with 500 British regulars and 200 frontiersmen, marched from Carlisle to its relief and defeated the Indians, reaching the fort August 9. In 1764 he erected the small brick blockhouse within the fort's outer walls which still stands, the only structure of Colonial times in Pittsburgh and the last vestige of British rule in western Pennsylvania. It was deeded to the local chapter of the Daughters of the American Revolution by Mrs. Schenley and is maintained by them. A special act of the Legislature insures its preservation.

In 1764 John Campbell laid out a small plan of lots near the fort, known as the "military plan," and still referred to. The Indian claim to most of the country about Pittsburgh was extinguished in a treaty made with the Iroquois in 1768 at Fort Stanwix. All remaining Indian lands in Pennsylvania were purchased by the State in 1784. In January, 1769, the Penns surveyed the Manor of Pittsburgh, containing 5766 acres, and opened a land office for the sale of lots. Emigration set in so strongly, however, from Virginia that Virginia influence predominated, and that Colony obtained control. Washington visited Pittsburgh again in 1770 and wrote: "The houses, which are built of logs, and ranged in streets, are on the Monongahela, and I suppose may be about 20 in number, and inhabited by Indian traders." In 1772 Fort Pitt was evacuated by the British, but in 1774 was occupied and repaired by Virginia militia, and Virginia authority was established and maintained by force of arms. Virginia governed the country until the boundary dispute was settled in 1781. During the Revolution Fort Pitt was garrisoned by Continental troops. The Penns, after the confiscation of their estates, being allowed to retain their manors, began a new sale of lots in Pittsburgh in 1784, and a survey was made which became the plan of the original borough. Arthur Lee described the town that year in scathful terms and predicted, "The place, I believe, will never be very considerable." Allegheny County was erected in 1788, and the county seat was established at Pittsburgh. The opening of the Northwest Territory, and the steady emigration via the river to Kentucky, gave Pittsburgh's trade a great impetus, but the real growth did not begin until after Wayne's defeat of the Indians and the close of the Indian hostilities in 1795. The first newspaper west of the Alleghenies, the "Pittsburgh Gazette," was established July 29, 1786. Pittsburgh was created a borough in 1794. That year the disturbances known as the Whisky Insurrection culminated and involved Pittsburgh actively. The first steamboat on the Western rivers was launched at Pittsburgh in 1811. Pittsburgh became a city in 1816. The manufacture of window glass began in 1797, and in the decade following shipyards, foundries, cotton factories, and shops for metal working were established. The first bank was established in 1804. The Pennsylvania Canal was constructed into the city in 1834. An era of prosperity followed, checked somewhat by the disastrous fire of April 10, 1845, which destroyed property valued at \$6,000,000. The first railroad entered the city in 1851. In 1877 the great railroad strikes, which prevailed throughout the country, affected Pittsburgh early, and on July 21 and 22 property valued at \$3,000,000 was destroyed by mob

violence. During those two days 27 persons were killed. Order was restored on July 23.

Consult: Craig, *Olden Time* (Pittsburgh, 1846-48); id., *History of Pittsburgh* (ib., 1851); Albach, *Annals of the West* (ib., 1856); McKnight, *Our Western Border* (ib., 1875); *History of Allegheny County* (Philadelphia, 1776); Chapman, *The French in the Allegheny Valley* (Cleveland, 1887); *History of Allegheny County* (Chicago, 1889); Darlington, *Fort Pitt and Letters from the Frontier* (Pittsburgh, 1892); Withers, *Chronicles of Border Warfare* (Cincinnati, 1895); *Standard History of Pittsburgh* (Pittsburgh, 1898); *Frontier Forts of Pennsylvania* (Harrisburg, 1896); Hassler, *Old Westmoreland: A History of Western Pennsylvania during the Revolution* (Pittsburgh, 1900); Kilkelly, *History of Pittsburgh* (Albany, 1906); Boucher, *Century and a Half of Pittsburgh and her People* (2 vols., New York, 1908); Olmstead, *Economic Survey of Pittsburgh* (Pittsburgh, 1910); Kellogg, *The Pittsburgh Survey* (6 vols., New York, 1910-15).

PITTSBURGH, UNIVERSITY OF. A coeducational institution for higher education, which succeeded the Western University of Pennsylvania, incorporated in 1813 at Allegheny. This institution in turn was the successor to the Pittsburgh Academy, which was founded in 1786 and incorporated in 1807. In 1908 the name was changed to the University of Pittsburgh, and the institution was removed to its new campus of 43 acres at Schenley Farms, in Pittsburgh. The organization of the college includes the college department, comprising the college, the school of education, and the school of economics; the technical department, comprising the school of engineering and the school of mines; the professional department, comprising the schools of medicine, law, dentistry, and pharmacy; and the graduate department, comprising the graduate school, the observatory, and the Mellon Institute of Industrial Research. The total enrollment in all departments in 1914-15 was 3523, and the instructors numbered 340. The endowment funds amount to \$525,000, and the annual income amounts to about \$496,000. The library contains about 40,000 volumes. The chancellor in 1915 was Samuel Black McCormick, D.D., LL.D.

PITTSBURG LANDING, BATTLE OF. See SHILOH, BATTLE OF.

PITTSFIELD. A town in Somerset Co., Me., 20 miles northeast of Waterville, on the Sebasticook River and on the Maine Central Railroad (Map: Maine, C 4). It contains the Maine Central Institute and a public library. There are woolen mills, a creamery, packing houses, and lumber and shoddy mills, for which the river furnishes excellent power. Pop., 1900, 2891; 1910, 2891.

PITTSFIELD. A city, including several villages within its corporate limits, and the county seat of Berkshire Co., Mass., 150 miles west of Boston, on the Boston and Albany and the New York, New Haven, and Hartford railroads; the centre of an extensive street-railway system connecting Berkshire points (Map: Massachusetts, A 3). Its site in a hill-girt valley of the Berkshires, among lakes, over 1000 feet above sea level, is of great natural beauty. One of the public parks has the fine statue of "The Color Bearer." The city occupies 41 square miles and has 150 miles of streets. Among noteworthy structures are the courthouse, built

of white marble, the Crane Museum of Natural History and Art, the Berkshire Athenæum, the latter containing a public library of 70,000 volumes, the House of Mercy and Hillcrest hospitals, tuberculosis hospital, Y. M. C. A., the Henry W. Bishop Training School for Nurses, the Berkshire County Home for Aged Women, the high school, the Berkshire Life Insurance Building, the Agricultural National Bank, and the Berkshire County Savings Bank. Situated in the heart of the famous Berkshire Hills, Pittsfield is an attractive residential place and a popular summer resort. It is known also for its manufacturing interests. According to the census of 1909, \$15,080,000 was invested in the various industries, which had a production valued at \$15,215,000 and gave employment to 7414 persons. The leading establishments are woolen mills, a silk mill, foundries and machine shops, electrical machinery and supply works, manufactories of underwear, thread and braid, stationery, clothing, and paper-making machinery, paper mills, a piano factory, etc.

The government, under a charter of 1895, is conducted by a mayor, chosen annually, and a bicameral council that elects most of the administrative officers. The school committee is chosen by popular vote. The mayor appoints license commissioners. The water works, valued at more than \$2,000,000, are owned and operated by the municipality. Settled in 1743 as Ponttosuck, or Boston Plantation, Pittsfield was incorporated as a town under its present name in 1761 and in 1891 was chartered as a city. Longfellow stayed for a time at the Appleton House here. Oliver Wendell Holmes and Herman Melville lived near by. Pop., 1900, 21,766; 1910, 32,121; 1915 (State census), 39,301. Consult J. E. A. Smith, *The History of Pittsfield* (Springfield, 1876).

PITTSTON. A city in Luzerne Co., Pa., 9 miles southwest of Scranton, on the Susquehanna River, below the mouth of the Lackawanna, and on the Lehigh Valley, the Lackawanna and Wyoming Valley, the Central of New Jersey, the Delaware and Hudson, the Lackawanna, and the Erie railroads (Map: Pennsylvania, K 3). Situated in the anthracite region of the State, it is engaged principally in mining and preparing coal for market, the city being the headquarters of two State inspection districts, with 72 mines producing nearly 10,000,000 tons annually. The manufacturing establishments include foundries and machine shops, stove works, knitting mills, paper, silk, and woodworking mills, breweries, terracotta and cut-glass works, brickworks, etc. Pittston is one of the leading commercial and industrial centres of this region. The borough of West Pittston (q.v.), across the river, and connected by three bridges, is more distinctly a residential place. The city maintains a hospital and a fine high school. Laid out in 1768 and named in honor of William Pitt, Pittston was settled about 1770, was incorporated as a borough in 1855, and was chartered as a city in 1894. It has adopted the commission form of government. Pop., 1900, 12,556; 1910, 16,267; 1914 (U. S. est.), 17,847.

PITUITARY BODY (Lat. *pituitarius*, relating to phlegm, from *pituita*, phlegm; connected with *spuere*, Gk. *πρῆνναι*, *ptyein*, Lith. *spiauti*, Lett. *splaut*, OChurch Slav. *plivati*, *plynti*, Goth. *speiwan*, OHG. *spāvan*, Ger. *speien*, AS. *spīwan*, Eng. *spew*, and ultimately with

Eng. *spit*). The hypophysis of the brain, often called the pituitary gland, is an appendage of the lower side of the twist-brain in vertebrates. It occupies the pituitary fossa, or sella turcica, a bony depression in the sphenoid bone at the base of the skull. In size it averages $10 \times 12 \times 7$ millimeters, weighs six grams, and is divided into two lobes, anterior and posterior, connected by a stalk, the pars intermedia, or infundibulum. Each lobe has an entirely distinct embryonic origin. The anterior lobe is the larger and springs from the upper part of the buccal cavity (Rathke's pouch) of the embryo. In the human being this lobe is of a reddish-gray color and is made up of glandular elements. The posterior lobe is structurally continuous with the infundibulum and is a process of the brain. It occupies a depression in the anterior lobe, is smaller, paler, and is made up of connective tissue fibres, nerve cells, and eosinophile cells. The infundibulum is partly glandular, partly vascular in structure. In the lower vertebrates both it and the posterior lobe are clearly made up of nerve tissue, but in the higher animals this lobe is almost destitute of nerve substance. The physiology of the body is complex and still unsettled, and it has been the subject of lively investigation during late years. It seems evident that the pituitary and thyroid glands have a reciprocal, complementary, or compensatory relation in their influence on nutrition and growth. For example, in many cases of cretinism and myxoedema (qq.v.) in which there is functional atrophy of the thyroid, an enlargement of the pituitary body is often observed, as well as in cases where the thyroid has been surgically ablated. Destruction or disease of the pituitary, on the other hand, commonly (but not invariably) accompanies acromegaly (q.v.). Experimental removal of the gland results in cachexia and death. The hypophysis is now regarded as a ductless gland having an internal secretion. In the form of an extract it has been given empirically without, however, yielding reliable data. An extract of the infundibulum has been found to raise the blood pressure and contract unstriated muscle fibres, and it is therefore administered in shock, intestinal paresis, and to hasten parturition. Consult Harvey Cushing, *The Pituitary Body and its Disorders* (Philadelphia, 1912). See ORGANOTHERAPY; SECRETIONS, INTERNAL; and authorities there cited.

PIT VIPER. See CROTALIDÆ.

PITYRIASIS (Neo-Lat., from Gk. *πυρρα*, *pyrra*, *pityria*, from *πυρον*, *pityron*, bran). A term applied by the older dermatologists to a group of skin affections which are characterized by a fine, branlike, scaly eruption. These diseases are now known to be pathologically dissimilar, but the term persists. *Pityriasis capitis* is seborrhœic eczema; in its dry form it is commonly known as dandruff. *Pityriasis versicolor*, or *tinea versicolor*, is characterized by the occurrence of brown or dark-yellowish patches upon the trunk, particularly those parts which are covered by clothing. It is due to a parasite, the *Microsporon furfur*. *Pityriasis infantilis* and *pityriasis senilis* are forms of eczema occurring respectively in infants and in aged persons. The typical variety of the disease is *pityriasis rubra* (of Hebra), known also as exfoliative dermatitis, in which there is a gradual dissemination of papules over the trunk and upper extremities, especially upon the dorsal as-

pect of the forearms and phalanges. The papules are bright red or slightly brownish, and are succeeded by large red spots or plaques. Changes occur in the surface of the skin, incident to the scratching which the itching provokes. A more severe form was called *pityriasis rosea* and a macular form was also described, probably identical with lichen (q.v.). Consult H. W. Stelwagon, *Treatise on Disease of the Skin* (7th ed., Philadelphia, 1914).

PITYUSÆ. The southwestern group of the Balearic Islands, consisting of the islands of Iviza and Formentera (qq.v.) and a number of small, uninhabited islets.

PI-TZŪ WO, p'ē-tsōō wō'. A small seaport on the east coast of the peninsular portion of Liaotung (q.v.). It lies north of Ta-lien-wan, has many large warehouses and considerable trade, and was included in the territory leased by Russia. The harbor is well sheltered, but is shallow. During the Russo-Japanese War (q.v.) the Second Japanese Army under General Oku was disembarked at Pi-tzū Wo in May, 1905.

PIURA, pē-ōō'rá. A northern department of Peru (Map: Peru, A 5). The area is estimated at 14,834 square miles. The eastern part is mountainous, with fertile valleys; the western is mostly desert land. Cotton is grown to some extent and some minerals are found, of which the petroleum deposits are extensively exploited. Pop. (est.), 205,300.

PIURA. The capital of the Department of Piura, Peru. It is situated 20 miles from the coast and 80 miles southeast of Cape Blanco (Map: Peru, A 4). It is a well-built town with a beautiful garden plaza containing a marble statue of Liberty. It is an important cotton market, and is connected by a railroad with the port of Paita (q.v.). Pop. (est.), 14,000. Piura was the first permanent settlement made by Pizarro.

PIUS. The name of 10 popes.—**PIUS I**, SAINT. Pope, 140-154. Little is known of his pontificate; perhaps the most authentic record of it is that contained in the Muratorian Fragment, which assigns the writing of the *Shepherd* by Hermas, his brother, to his pontificate. (See HERMAS, SHEPHERD OF.) Consult Louis Duchesne, *Histoire ancienne de l'église*, vol. i (Paris, 1906).—**PIUS II**, better known generally as Æneas Sylvius. Pope, 1458-64. He came of the noble family of Piccolomini in Siena, and was born in 1405 in the village of Corsignano, afterward called Pienza from his papal title. His early life was not free from serious irregularities, but he made amends by his subsequent decorous conduct; and his eminent abilities as a canonist led to his being employed, when but 26 years of age, as secretary to the Cardinal-Bishop of Fermo, an appointment which, though it lasted but a short time, led to further employment and brought him commissions of the highest importance in connection with the Council of Basel (q.v.). On the election of the antipope Felix V (Duke Amadeus VIII of Savoy), in 1439, he was chosen one of the deputation to notify him of his election, and became his secretary, in which post his eminent literary abilities were conspicuously useful. Having been sent as Ambassador to the Emperor Frederick III, he was induced to accept office in the Imperial Chancery. This opened the way for further steps in the diplomatic career of

which his prudence took advantage. On a mission to Rome in 1445 he declared himself decidedly for Eugenius IV and attached himself to his interests. Having at last decided to take holy orders in that year, he was made Bishop of Triest in 1447 and of Siena in 1449, remaining, however, in the Imperial service until 1455. A year later he was made Cardinal by Calixtus III. On the death of this pontiff, in 1458, after a conclave lasting only three days, Æneas Sylvius was elected his successor. As Pope he devoted himself to rousing Christendom to a war against the Turks. He called a congress of princes to meet at Mantua in 1459, and appeared in person to preside over it, but little came of it for the time. Undeterred by discouragements, he pursued his purpose, and had planned to go in person against the Turks; but, seized with illness at Ancono, where the fleet was to assemble, he died (Aug. 14, 1464). The literary reputation of Æneas Sylvius has partially eclipsed the historical fame of the Pope. He was one of the most eminent scholars of his age, in many ways a type of the Renaissance learning. The most interesting portion of his works is the collection of his letters, which are full of details characteristic both of the writer and of his age. He left also some partly autobiographical commentaries (republished by Lesca, Rome, 1894). Others of his works, the novel *Lucretius et Euryalus* and his dialogues on the authority of general councils and in defense of the Council of Basel, he formally retracted. Consult: C. Voigt, *Enca Silvio di Piccolomini als Papst Pius II und sein zeitalter* (3 vols., Berlin, 1856-63); G. W. Kitchen, *Life of Pius II as Illustrated by Pinturicchio's Frescoes* (London, 1881); Mandell Creighton, *History of the Papacy*, vol. iii (ib., 1903); Ludwig Pastor, *History of the Popes*, vols. i-iii (ib., 1906-10); William Boulting, *Æneas Silvius (Pius II), Orator, Man of Letters, Statesman, and Pope* (ib., 1908); C. M. Ady, *Pius II, the Humanist Pope* (ib., 1913), containing an exhaustive bibliography.

PIUS III (Francesco Todeschini Piccolomini). Pope, 1503. He was a nephew of Pius II, who made him Bishop of Siena and Cardinal in 1460. He was employed by subsequent popes in various important missions, and succeeded Alexander VI, but lived only a month after his election. Consult Ludwig Pastor, *History of the Popes*, vol. vi (London, 1911).—PIUS IV (Giovanni Angelo Medici, or Medeghino). Pope 1559-65. He was born in 1499, studied medicine and law, and devoted himself to the latter as a profession. Later he went to Rome and entered on an ecclesiastical career, being named Archbishop (1545) and Cardinal (1549) by Paul III. Elected Pope after a conclave lasting more than three months, he entered upon a heritage of many troublesome questions. The principal significance of his pontificate lies in his reassembling of the Council of Trent, which Paul IV had thought to have practically completed its task. It was finally closed, after further sessions lasting nearly two years, in December, 1563, and the bull confirming its decrees was issued January 26 following. The well-known creed called the Creed of Pius IV, or the Tridentine confession of faith, was issued by Pius as an embodiment of all the doctrines defined in the council. (See PIUS IV, CREED OF.) Pius exerted himself vigorously to carry out the reforming decrees of the council, though much of this work was

reserved for the following pontificate. He died Dec. 9, 1565, in the arms of his nephew, Charles Borromeo (q.v.), whom he had made Cardinal. Consult *Cambridge Modern History*, vol. ii (New York, 1904), and Leopold von Ranke, *History of the Popes*, vol. i (London, 1908).—PIUS V, SAINT (Michele Ghislieri). Pope, 1566-72. He was born in 1504 at Bosco, near Alessandria, entered the Dominican Order at 14, and after the completion of his studies was employed in various capacities, educational and administrative. Paul IV made him Bishop of Sutri in 1556, Cardinal in 1557, and grand inquisitor in 1558. His main task as Pope was to enforce the reforming decrees of the Council of Trent. Auster and self-denying in his personal life, he expected equal devotion on the part of others, and met opposition with unflinching firmness. He republished the bull *In Cæna Domini* (q.v.) in a more rigorous form, and excommunicated and attempted to depose Elizabeth of England for her refusal to submit. He was urgent for the abolition of all toleration of Protestantism. The resources of the papacy were employed to assist the Catholic cause against the Huguenots in France, to aid Spain in overpowering the Netherlands, and to protect Christendom from the Turks. With Spain and Venice Pius organized the Holy League against the Turks, who were signally defeated in the naval battle of Lepanto. He completed the Roman catechism and published thoroughly revised editions of the missal and breviary. He was canonized by Clement XII in 1712. Consult: Joseph Mendham, *Life and Pontificate of Pius V* (London, 1832); F. A. P. Falloux, *Histoire de saint Pie V* (3d ed., 2 vols., Paris, 1858); Benno Hilliger, *Die Wahl Pius V zum Papste* (Leipzig, 1891); *Cambridge Modern History*, vol. ii (New York, 1904); Leopold von Ranke, *History of the Popes*, vol. i (London, 1908).

PIUS VI (Giovanni Angelo Braschi). Pope 1775-99. He was born of an impoverished but noble family in 1717 and early entered the ecclesiastical service, being made Cardinal in 1773 by Clement XIV, whom he succeeded two years later. After long controversy he was obliged to compromise on questions of ecclesiastical appointments with the Emperor Joseph II and the King of Naples; but his greatest troubles came from the aggressions of the French Republic. The Pope had rejected the clerical laws of 1791 and protested against the execution of Louis XVI. In 1793 a popular tumult in Rome, which was caused by the imprudence of a French political agent named De Basseville, resulted in his death and added to the difficulties. In 1796 Bonaparte took possession of the legations and afterward of the March of Ancona, and by a threatened advance upon Rome extorted from Pius, in the Treaty of Tolentino (February, 1797), the surrender of these provinces, which were constituted part of the Cisalpine Republic. Finally the Directory ordered an advance upon Rome; Berthier entered the city Feb. 10, 1798, where the Roman Republic was proclaimed, and 10 days later the Pope, refusing to renounce his temporal sovereignty, was seized and carried off to Siena and later to the Certosa, near Florence. On the threatened advance of the Austro-Russian army in the following year, he was transferred to Grenoble, and finally to Valence on the Rhone, where, worn out by age and the rigor of confinement, he died, Aug. 29, 1799, after the

longest pontificate until then recorded. Consult: F. K. Nielsen, *History of the Papacy in the Nineteenth Century* (2 vols., New York, 1906); Jules Gendry, *Pie VI* (2 vols., Paris, 1907); *Cambridge Modern History*, vol. x (New York, 1907); Leopold von Ranke, *History of the Popes*, vols. ii, iii (London, 1908-12). For his French relations, consult *Acta Pii VI* (2 vols., Rome, 1871).

PIUS VII (Gregorio Luigi Barnaba Chiaramoni). Pope, 1800-23. He was born at Cesena in 1742, entered the Benedictine Order at the age of 16, and was employed in teaching philosophy and theology at Parma and afterward at Rome. He was appointed Bishop of Tivoli, and in 1785, being created Cardinal, was transferred to the see of Imola. Upon his election to the papacy in 1800 Rome was restored to the papal authority, and in July of that year Pius VII entered his capital, and in the following year the French troops were withdrawn from the papal territory, with the exception of the legations. From this time forward Pius, ably seconded by his Secretary of State, Cardinal Consalvi, was destined to occupy a prominent place in the political as well as the ecclesiastical affairs of Europe. Bonaparte had resolved to restore religion in France on the ancient basis of connection with Rome. With this view he entered into negotiations with Pius VII for the establishment of a concordat suited to the new order of things which had arisen. It was agreed to at Paris, July 15, 1801, ratified in Rome, August 14, and published in Notre Dame on Easter Sunday, 1802. But, simultaneously with the concordat, and as if forming part of the same arrangement, was published a code of what were called organic laws, seriously affecting the discipline of the Church with regard to marriage, the clergy, and public worship, which had never been submitted to Pius, and to which he not only had not consented, but to which he found himself compelled to offer every opposition. For the first year following the publication of the concordat no occasion of difficulty arose, but conflict of principles was in the end inevitable. In 1804 Bonaparte, having resolved on assuming the Imperial crown, invited Pius to come to Paris for the purpose of crowning him, and the Pope, although with much hesitation, consented. He took advantage of his visit to demand the recall or modification of the articles of the code, but without success, and although, during his visit to Paris, he was treated with great distinction and reverence, his relations with Napoleon from that date began to assume a less friendly character. The French Emperor now proceeded from one petty outrage to another, until finally, in February, 1808, the French troops, under General Miollis, entered Rome and took possession of the Castle of Sant' Angelo, and on April 2 a decree was issued annexing the provinces of Ancona, Ferma, Urbino, and Macerata to the Kingdom of Italy. Pius, besides protesting against the usurpation, declared himself a prisoner in the French hands and confined himself to his palace. Finally (May 17, 1809) the usurpation was consummated by a decree annexing Rome and all the remaining papal territory to the French Empire. This was the signal for the Pope's abandoning his policy of forbearance. On June 10 Pius issued a bull of excommunication, directed (without naming Napoleon) against the perpetrators and abettors of the invasion of the rights and

the territory of the holy see. Soon afterward the French Emperor ordered the removal of the Pope from Rome; and Pius, without offering any resistance beyond the declaration that he yielded to force, was removed, first to Florence, then to Grenoble, thence for a longer time to Savona, whence, in June, 1812, he was finally transferred to Fontainebleau. During this prolonged captivity Pius firmly but quietly resisted every effort to compel or seduce him from his policy. At Fontainebleau he was treated with much external respect; and on Napoleon's return from the Russian campaign, in December, 1812, orders were given that the cardinals, with certain exceptions, should be admitted to the presence of the Pope. Under much pressure, both from the Emperor, himself and from the ecclesiastics to whom the Emperor confided his plans, Pius was induced to sign a new concordat, an important provision of which was the recognition of the annexation of the Roman states to the Empire. Having obtained the concession, Napoleon at once permitted the absent cardinals to return, and of these many remonstrated so earnestly against the concordat that, on March 24, Pius wrote to revoke his consent. Napoleon took no notice of the revocation; nor was it till after the disasters of 1813 that he began to seek an accommodation. Pius refused to treat until he should be restored to Rome, and on Jan. 22, 1814, orders were sent for his immediate return to his capital. Unattended by his cardinals, he was escorted to Italy, and remained at Cesena until the campaign of the spring of 1814 placed Paris in the hands of the allies, when Pius reentered Rome amid the gratulations of the people. During the Hundred Days he was again compelled to leave it; but, after the campaign of Waterloo, he finally resumed possession, which was undisturbed for the rest of his life, and extended to the whole of the ancient territory, including the legations. His last years were devoted to measures of internal administration and were marked by much wisdom and moderation. Pius repressed with great vigor the disorder and brigandage which the long wars had encouraged, and the secret societies, especially that of the Carbonari (q.v.). In 1814 he formally restored the Order of Jesuits (q.v.). His private life was a model of gentleness, simplicity, and benevolence. Consult: François Artaud de Mentor, *Histoire du pape Pie VII* (3d ed., 3 vols., Paris, 1839); Cardinal Pacca, *Historical Memoirs* (Eng. trans. by Sir George Head, London, 1850); D'Haussonville, *L'Eglise romaine et le premier empire* (5th ed., 5 vols., Paris, 1870); M. H. Allies, *Pius VII, 1800-1823* (2d ed., London, 1897); *Cambridge Modern History*, vols. ix, x (New York, 1906-07); Leopold von Ranke, *History of the Popes*, vol. ii (London, 1908)—PIUS VIII (Francesco Xaverio Castiglioni). Pope, 1829-30. He was born at Cingoli, near Ancona, in 1761. He held in succession the bishoprics of Montalto, Cesena, and Frascati, and was made Cardinal in 1816. During his brief pontificate he opposed the slave trade in Brazil, civil marriages in Prussia, and the attacks on the Church emanating from Freemasons and Bible societies. Consult: François Artaud de Mentor, *Histoire du pape Pie VIII* (Paris, 1843); Wiseman, *Recollections of the Last Four Popes* (London, 1858); *Cambridge Modern History*, vol. x (New York, 1907).

PIUS IX (Count Giovanni Maria Mastai-Fer-

retti). Pope, 1846-78. He was born at Sinigaglia, May 13, 1792, and intended to enter the Papal Guards, but symptoms of an epileptic tendency caused him to abandon a military life. He took holy orders and became Archbishop of Spoleto in 1827, Bishop of Imola in 1832, and Cardinal in 1840. He was elevated to the papal chair on June 16, 1846, two weeks after the death of Gregory XVI. Pius IX took hold of the reins of government in the pontifical dominions, imbued with a sense of the evils, political, economic, and social, under which his semimedieval realm had been laboring and with a patriotic desire to raise Italy from her political degradation. He entered at once on a course of reforms, resolving to extirpate all abuses of administration in his state, to secularize the local administration, and to extend the rights of self-government. His first steps were to dismiss his Swiss guards and to grant a general amnesty. The latter measure unfortunately had the effect of bringing together a body of men whom exile had embittered against the existing state of things. The Pope extended his innovations to every department of the administration, not sparing the ecclesiastical institutions and the clergy. At the same time he exerted himself strenuously to improve the economic condition of his people and to promote their intellectual progress. His subjects were permitted to make their voice heard in public assemblies and in the press. His policy awakened enthusiasm among the friends of progress throughout Europe, Protestants and Jews, as well as Roman Catholics. Pius IX was inspired with the dream of a free Italy, and sought to realize the ideal set forth by Gioberti of a federated Italy under the moral primacy of the Pope. But the programme which he embraced was far from satisfying the demands of the revolutionary party represented by Mazzini and his followers, and Austria was ready to combat with force of arms a policy which threatened to subvert her dominion in Italy.

In April, 1847, the Pope announced the institution of a *consulta*, an advisory body consisting of deputies from the provinces. When it assembled in November Pius IX found that he had created a mouthpiece of radical demands, vehemently set forth and backed by the populace, which he was utterly unable to satisfy. A few months later the February revolution of 1848 overthrew the Orleanist monarchy in France, and the Papal States were borne along on the flood of revolution which swept over Europe. Pius IX was forced, while yet unprepared for it, to grant a regular constitution to his subjects, which was promulgated on March 14, 1848. It was an anomalous creation, providing for a triple machinery of legislation—a consistory of cardinals, an advisory council appointed by the Pope, and a Parliament of two chambers. A few days after this event Lombardy and Venice rose against the Austrians, and Charles Albert, King of Sardinia, embarked upon a war for the liberation of Italy. Pius IX was dragged against his will into a struggle with the house of Hapsburg, which was to prove utterly futile. On June 11 the papal forces were compelled to surrender to the Austrians at Vicenza. On July 25 the King of Sardinia met with disaster at Custoza. The revolutionary elements now obtained complete mastery in Rome. On November 15 the Pope's Prime Minister, Count Rossi, was assassinated as he was about to open the session of the Par-

liament. Violent demonstrations took place daily to compel the Pope's assent to measures which he repudiated. He at first confined himself in the Quirinal, and on November 24 fled secretly from Rome, taking refuge in the Neapolitan fortress of Gaeta. A republic was proclaimed in Rome in February, 1849. Pius IX from his exile addressed a remonstrance to the various sovereigns. In April a French expedition, sent to restore the papal authority, landed at Civitavecchia, which surrendered on July 2, after a month's siege. The Pope's government was reestablished, and in 1850 he again entered upon the administration. He now declared that, in view of the unsettled condition of Italy and the failure of many of his early measures of improvement, he could not proceed with the reforms which he had contemplated. With Cardinal Antonelli as Secretary of State, the course of the papal government became intensely reactionary. In 1860, after the war for the unification of Italy, the Romagna, the Marches, and Umbria were annexed to the dominions of Victor Emmanuel, but Pius persistently refused to cede any portion or to enter into any compromise.

His ecclesiastical administration continued very active and proceeded upon the strongest assumption of the right of independent action on the part of the Church. He reestablished the hierarchy in England, sanctioned the establishment in Ireland of a Catholic university, and condemned the principles upon which the Queen's colleges in that country were constituted. He concluded with Austria a concordat much more favorable to Church authority than the existing ecclesiastical laws had permitted. (See CONCORDAT.) In 1854 he issued a decree propounding as a doctrine of the Church the dogma of the Immaculate Conception (q.v.) of the blessed Virgin Mary. The most important event of his pontificate was the convocation of the Vatican Council (q.v.), at which bishops from all parts of the Catholic world assembled, in December, 1869. This was the first Church council since that of Trent had crystallized Roman Catholic dogma and practice to meet the Reformation attack. It was adjourned in July, 1870, after it had proclaimed the decree of the infallibility (q.v.) of the Pope when on a subject of faith or morals he issues a decree *ex cathedra* to the universal Church. Soon after the adjournment the Italian army occupied Rome, which was made the capital of the Kingdom of Italy. Pius renewed with all solemnity his oft-repeated protest and, refusing all proposals of accommodation, from that date declared himself a captive in the Vatican, to which he strictly confined himself until his death, Feb. 7, 1878. Consult Alexander Pougeois, *Histoire de Pie IX et de son pontificat* (4 vols., Paris, 1877-81); Raffaele de Cesare, *Last Days of Papal Rome, 1850-1870*, Eng. trans. by Helen Zimmern (Boston, 1909); James MacCaffrey, *History of the Catholic Church in the Nineteenth Century* (2 vols., St. Louis, 1910).

PIUS X (Giuseppe Melchiorre Sarto). Pope, 1903-14. He was born at Riese, near Venice, June 2, 1835, the son of a postman. After studying at Treviso and at Padua and being ordained to the priesthood in 1858, he was chaplain at Tombolo for nine years and archpriest of Salzano from 1867 to 1875. In the latter year he was made canon of the cathedral of Treviso and in 1878 was elected vicar capitular. Sarto was named Bishop of Mantua in 1884; in that see,

then a hotbed of socialism and agnosticism, he established a reputation for able administration and uncompromising loyalty to the principles of the Church. At the secret consistory in 1893 he was created Cardinal by Pope Leo XIII, and three days later was preconized Patriarch of Venice. The Italian government, which claimed the right to nominate the Patriarch, as the Emperor of Austria had formerly done, refused for a year to grant Sarto his exequatur.

On Aug. 4, 1903, Cardinal Sarto was elected Pope, and five days later he was crowned. Before the end of the year he had abolished the traditional right of veto at the papal election, claimed by several European governments and exercised for the last time (by Austria) against Cardinal Rampolla (q.v.), who otherwise would have been Pope instead of Sarto. Pius early issued the *Motu Proprio*, providing for the reformation, in accordance with the authentic Gregorian Chant, of the music used in the ritual. In 1904 he established commissions to codify the canon law and to reform the Breviary, and later created a Biblical Institute under the control of the Jesuits. His decree *Lamentabile* (or "Syllabus of Pius X"), in which he declared to be errors 65 propositions in the instructions of candidates for holy orders, was published in 1907, and in the same year was issued his famous encyclical *Pascendi*, in which modernism was condemned. In 1906 Pius had resolutely opposed the French law designed to effect a separation of church and state, and, unwilling to compromise, he allowed valuable property to be taken by the secular government rather than sacrifice complete ecclesiastical independence. The Roman Catholic church in the United States he raised to an autonomous position—previously it had been under the missionary jurisdiction of the Propaganda—and in 1911 he created two additional American cardinals (Farley and O'Connell) to take their place beside Cardinal Gibbons. By the Pope's last important official act (May 25, 1914) 13 candidates received the red hat. His death, on August 20 of the same year, was probably hastened by anxiety over the outbreak of the European War. During his illnesses, and especially the last one, his spinster sisters, plain peasant women, cared for him devotedly. Consult: A. M. J. J. Waal, *Life of Pope Pius X*, translated from the second German edition by J. W. Berg (Milwaukee, 1904), Angelo Marchesan, *Papst Pius X in Leben und Wort* (Einsiedeln, 1906); *The Programme of Modernism: Reply to Encyclical of Pius X* (New York, 1908); also *Life of Pope Pius X*, published anonymously (ib., 1904), and *Acta Pii PP. X* and *Acta Apostolicæ Sedis* (Vatican Press).

PIUS IV, CREED OF. The dogmatic formula drawn up by a commission of members of the Council of Trent as a summary of its decisions and promulgated by Pope Pius IV at the end of 1564 in the bull *In Sacrosancta*. Its formal acceptance is required of all priests and teachers in the Roman Catholic church, as well as of all converts to that communion. It begins by embodying the Nicene Creed and proceeds to the later more elaborate definitions. Successive articles declare belief in apostolical and ecclesiastical traditions and all other observances and constitutions of the Holy Roman church; the Holy Scriptures according to that sense which the Church has held and does hold; seven sacraments of the new law instituted by Christ and

necessary for the salvation of mankind, though not of every one; the definitions of the Council of Trent concerning original sin and justification; the doctrine of a true, proper, and propitiatory sacrifice in the mass, transubstantiation, and the reception of Christ whole and entire under either kind, a purgatory, the souls detained in which are helped by the prayers of the faithful; the veneration and invocation of the saints reigning together with Christ and the veneration of their relics and of sacred images; the power and use of indulgences; and the position of the Holy Catholic Apostolic Roman church as the mother and mistress of all churches. It concludes with a promise of fidelity to this faith and of obedience to the Bishop of Rome, successor to St. Peter, Prince of the Apostles and Vicar of Jesus Christ. Its full text may be found in Philip Schaff, *Creeds of Christendom*, third edition, vol. i (New York, 1881).

PIUS IX, ORDER OF. A papal order of merit with two classes, founded by Pius IX in 1847. It is conferred on the nobility for virtue and merit. The decoration is an eight-pointed blue star with gold flames between the arms. The device is *Virtuti et Merito*. Members of the order have a dark-blue uniform embroidered with gold. See Plate I of ORDERS.

PIUTE, or PAIUTE. A name applied loosely to various small bands of Shoshonean stock (q.v.), scattered over the arid region between the Rocky Mountains and the Sierras, from the Colorado almost to the Columbia, in Nevada, northwestern Arizona, eastern California and Oregon, western Utah, and southern Idaho. According to Powell, who took a census of the bands in 1873, the name belongs properly only to those living in or adjoining southwestern Utah, while those now gathered upon Pyramid Lake and Walker River reservations in Nevada, popularly and officially recognized as Piute, are really of another tribe and language, which he calls Paviotso. Still others he classes with the Shoshoni and Banak. A few bands, as the Chemehuevi along the Colorado in northwestern Arizona, and the Mono in the Sierras of eastern California, have acquired a separate tribal recognition. Those of Oregon and the north are frequently known also as Snakes. See SHOSHONI.

Living in a country too barren, as a rule, for agriculture or large game, the Piute subsisted chiefly upon wild seeds, berries, and roots, grasshoppers, and jack rabbits, with fish and ducks from the few scattered lakes. Their houses were the so-called wikiups, low, dome-shaped or elliptical structures open at the top, covered with mats woven from rushes, and equipped with a variety of well-made baskets, but otherwise destitute of furnishing. They formerly went nearly naked, excepting in the coldest weather, when they wrapped around their bodies thick blankets woven from jack-rabbit skins cut into strips, with the hair left intact. Their ordinary weapons were the bow and arrow and club. They did not use the lance or shield, and very few owned horses. The dead were usually cremated. The Ghost Dance religion, the greatest Indian religious movement of modern times, originated among the Piute of Walker River Reservation. Some of the bands were hostile up to 1864, since which time treaties of peace have been made and a large number assigned to reservations. According to the census of 1910 the Piute proper numbered 780. Consult A. L.

Kroeber, *Shoshonean Dialects of California* (Berkeley, 1907).

PIVERT DE SENANCOUR, ETIENNE. See SENANCOUR, E. P. DE.

PIZARRO, pē-zār'rō. A melodrama by Sheridan, produced in 1799. It was taken from Kotzebue's drama *Die Spanier in Peru*.

PIZARRO, Sp. pron. pē-thār'rō, FRANCISCO (c.1470-1541). The conqueror of Peru. He was the illegitimate son of Gonzalo Pizarro, a prominent soldier in the army of the great captain Gonsalvo de Córdoba, and was born at Trujillo, in Estremadura, Spain. In 1509 he sailed for America with Ojeda, whose fortunes he followed for several years. In 1519 he settled down on a small land holding in the new city of Panama. Three years later he formed a partnership with Diego de Almagro (q.v.) and Father Luque to explore the country discovered by Andagoya to the south of the isthmus. A first expedition in 1524 accomplished nothing, and a second in 1526, undertaken with the assistance of Gaspar de Espinosa, threatened to ruin the partners. Enough of the country was seen, however, to prove that it contained much wealth, and so Pizarro landed on the island of Gallo, not very far from the equator, while Almagro returned for assistance. The sufferings of the men had been so great, however, that the Governor at Panama sent a vessel to bring them all back. Pizarro refused to embark, and drew on the sand with his sword the famous dividing line, beyond which he declared lay labor, hunger, thirst, sickness, and every kind of danger, but also the chance for glory and heroic achievement. Thirteen men crossed to stand by him, while the rest went back to Panama. Pizarro maintained himself for several months until the arrival of Almagro, and then they continued to explore the mainland as far as the Gulf of Guayaquil. Convinced that his resources were insufficient to embark upon the conquest of this highly civilized region, Pizarro collected irrefutable evidences of its wealth, and then went back to Panama, whence he proceeded to Spain in 1528. Charles V granted him authority to conquer and govern this territory with the title of Adelantado. Pizarro enlisted a considerable force, including his four brothers. (See PIZARRO, GONZALO.) In 1530 he was back at Panama, and in January, 1531, he started for the real conquest of Peru. The rest of the career of Francisco Pizarro belongs to history of Peru (q.v.). Consult: Sir Arthur Helps, *Life of Pizarro, with Some Accounts of his Associates in the Conquest of Peru* (2d ed., London, 1869); Sir C. R. Markham, *A History of Peru* (Chicago, 1892); F. A. Ober, *Pizarro, and the Conquest of Peru* (New York, 1906); W. H. Prescott, *History of the Conquest of Peru*, in Everyman's Library (ib., 1909).

PIZARRO, GONZALO (c.1505-48). A Spanish conquistador, brother of Francisco Pizarro. See PERU, History.

PIZZICATO, pēt'sē-kū'tō (It., twitched), abbreviated pizz. A word used in music for stringed instruments to denote that the strings, instead of being played as usual by the bow, are to be twitched with the fingers in the manner of playing on a harp or guitar. The letters *c. a.* (*col arco*, with the bow) indicate that the use of the bow is to be resumed.

PIZZICOLLI, CRIACIO DE'. See CYBIACUS.

PLACE, FRANCIS (1771-1854). An English reformer. He was apprenticed to a maker of

leather breeches and afterward worked at that trade and as a tailor. In 1794 he joined the London Corresponding Society, a reform club, and for three years was prominent in its work. After 10 years of retirement (1797-1807), in which he diligently studied social and economic questions, he returned to politics, made the acquaintance of William Godwin, Robert Owen, Jeremy Bentham, James Mill, and many others, and about 1812 began indirectly a great work, acting as tutor or coach to various parliamentary reformers, among whom Joseph Hume should be mentioned. In 1824 he won a notable triumph by procuring the abolition of the laws against workingmen's combinations. Seven years afterward he was interested in the Reform Bill, and by his placard, "Go for Gold and Stop the Duke," brought on a brief run on the Bank of England and contributed to the causes preventing Wellington's forming a cabinet. With John Arthur Roebuck (q.v.) he wrote various political pamphlets in 1835. His pamphlets, letters, magazine and newspaper articles are diffuse and unattractive in style, but very valuable for the light they throw upon the social and economic history of the nineteenth century. *The Principles of Population* (1822) was his only published book. Consult Graham Wallas, *Life of Francis Place* (London, 1898).

PLACE, plās, VICTOR (1819-75). A French Assyriologist and diplomat, born in Paris. He entered the Foreign Office in 1839, acted as consular agent in Naples, Gibraltar, and Haiti, showing himself able and brilliant but grasping and self-seeking. In 1851 he became Consul at Mosul, succeeding Botta, whose work of excavation at Khorsabad he continued in conjunction with Oppert and Frenel. His discoveries, especially regarding Assyrian architecture, the large use made of colored enameled bricks on the lower parts of city walls, and the variety and brilliance of borders and figure decorations on these mural facings, were very valuable. The actual spoils of the excavations were loaded on a float buoyed with bladders, but in spite of these precautions they were lost in the river near Basra and could not be recovered. Place was highly honored by the Academy of Inscriptions on his return to France in 1855, and became Consul General at Jassy in Moldavia, a post from which he was soon removed because of his abuse of power. He was sent to Adrianople in disgrace, but in 1870 was transferred to New York, where he took advantage of his office and his country's need, bought defective rifles for the French army, and charged so high a price for them that he made more than 600,000 francs for himself before he was discovered. He was twice tried in Paris, and was sentenced to two years' imprisonment in 1872, but was pardoned by Thiers. Place's *Ninivé et l'Assyrie* (1867-70; text 2 vols., plates 1 vol.) is an authority on Nineveh.

PLACE DE LA CONCORDE. See CONCORDE, PLACE DE LA.

PLACE MAKER'S BIBLE. See BIBLE, CURIOUS EDITIONS OF.

PLACENTA (Lat., flat cake). The after-birth—a spongy vascular mass attached to the uterus before the birth of a young animal and expelled after labor is completed. It is the structure that unites the fetus to the wall of the maternal uterus. It occurs in all mammals except the egg-laying ornithorhyncs and echidna, though only rudimentary in the mar-

supials. It presents a variety of forms among the different mammals. Thus, in the pig, the mare, and the cetacea it is diffused over the whole interior of the uterus and is termed *diffuse*; in ruminants it is attached in scattered segments over the uterine wall, *cotyledonary*; in certain of the edentata, the elephant, and carnivora it occurs as a zone around the uterine surface, *zonary*; in most of the edentata, the insectivora, and rodentia it is found as a circular disk, *discoidal*; while in the monkeys and in man, being first arranged in scattered patches and later as a disk, it is known as *metadiscoidal*. The placenta is formed in its greater part from hypertrophy and other changes in those chorionic villi which chance to be in contact with the uterine surface when fetation begins. The development of these adherent villi produces what is known as the fetal portion of the placenta, while the remainder, the decidua serotina, furnishes the maternal portion. Around the placental villi are developed vascular spaces in which certain arteries and veins from the uterine wall communicate freely. The villi being thus immersed in the maternal blood, osmotic interchange takes place between the fetal and maternal circulations. On gross inspection the placenta presents itself as a round or slightly oval disk from 6 to 8 inches in diameter and from $\frac{3}{4}$ inch to 1 inch in thickness. The fetal surface is smooth and covered by the amniotic membrane, which is reflected from the cord on to the placenta at its centre and again from the placental margins to the uterine wall. The maternal surface is deep red, rough, and irregular, and is divided by numerous grooves or sulci. A close inspection shows this surface to be covered with a fine, delicate membrane which dips down into the sulci and which is the stripped-off cellular layer of the decidua serotina. Attached to the fetal surface of the placenta, usually at its centre, but occasionally at or near its margin, is the umbilical cord. The cord is a whitish, semitransparent structure of an average length of about 20 inches and a diameter about that of the little finger. It consists of two arteries and a vein twisted upon one another and surrounded by a peculiar gelatinous substance, called the jelly of Wharton, which gives the cord its characteristic appearance.

The function of the placenta is both respiratory and alimentary. It aerates the fetal blood by the interchange of oxygen and carbon dioxide. (See BLOOD; CIRCULATION.) In its nutritional function it supplies material for the growth of the fetus, at the same time removing waste products. The placenta is subject to several pathological abnormalities in form and attachment, to inflammation, and to degenerative changes. For their detailed description, and for the treatment of that dangerous form of misplacement known as placenta previa, consult H. J. Garrigues, *Obstetrics* (2d ed., Philadelphia, 1913).

PLACENTA. In plants, the region to which ovules are attached in an ovary. The name was given under the impression that ovules are eggs and that the tissue of the ovary wall from which the ovules develop should be called the placenta.

PLACENTIA. The ancient name for Piacenza (q.v.).

PLACE OF WAILING. An inclosed place near the Mosque of Omar (q.v.) in Jerusalem, where the Jews congregate every Friday to lament the fall of Israel and pray for its restora-

tion. The wall in front of which they gather is 156 feet in length and 59 feet in height. The nine lowest courses of stone consist of large blocks, some of which are drafted; one is 16 $\frac{1}{2}$ feet long and 13 feet wide. Above there are 15 courses of smaller stones. Some of the lower courses may have belonged to Herod's temple.

PLACER MINING. See GOLD.

PLACETAS, plā-sā'tās. A town of the Province of Santa Clara, Cuba, 22 miles southeast of the city of Santa Clara and connected by rail with the coast towns of Caibarien and Sagua la Grande (Map: Cuba, F 4). It is in the midst of an extensive sugar-producing region. Pop., 1899, 5409; 1907, 6184.

PLACE'US. See LA PLACE, JOSUÉ DE.

PLACIDE, plā-sēd', HARRY (1799-1870). An American comedian, born in Charleston, S. C. He was the son of a French variety actor and his training for the stage began in childhood. After living several years in the South he made his appearance in 1823 at the Park Theatre, New York, as Zekiel Homespun, one of his most popular characters, and for the next 20 years he was a member of the Park Theatre company. Here and afterward as a star he seems to have won the unmingled admiration of the critics in rôles as varied as those of the Fat Boy in *Pickwick*, Sir Harcourt Courtly in *London Assurance*, Sir Peter Teazle, Dr. Ollapod, and Grandfather Whitehead. After his retirement in 1865 he settled in Babylon, L. I. Consult J. N. Ireland, *Records of the New York Stage* (2 vols., New York, 1866-67), and W. L. Keese, *A Group of Comedians* (ib., 1901).

PLACID'IA. See HONORIUS; VALENTINIANUS III.

PLAC'ODERM (from Gk. πλαξ, *plax*, tablet, plate + δέρμα, *derma*, skin). An order under the subclass Ganoidei in the older classifications of fossil fish. It included genera in which the head and forward part of the trunk were covered by heavy plates; e.g., *Pterichthys*, *Bothriolepis*, *Coccosteus*, *Dimicthys*. The group was based on superficial resemblances, and it has been broken up and the genera distributed among other orders. See DIPNOI; LUNGFISH; OSTRACODERMI; and articles on the genera mentioned above.

PLACOIDEI, plā-koi'dē-i (Neo-Lat. nom. pl., from Gk. πλακῶδης, *plakōdēs*, flat, from πλαξ, *plax*, tablet, plate + εἶδος, *eidos*, form), or **PLACOID FISHES.** An order of cartilaginous fishes, in the classification proposed by L. Agassiz, characterized by having placoid scales, irregular plates of hard bone, not imbricated, but placed near together in the skin. The term is no longer in scientific use.

PLACOPH'ORA (Neo-Lat. nom. pl., from Gk. πλαξ, *plax*, plate, tablet + φέρω, *pherein*, to bear). A division of Mollusca, containing only the chitons. The modern chitons are descendants of a race which, though never represented by any considerable number of species or individuals, began in the early Paleozoic and persisted with little change of form down to the present day. The first are known in the Ordovician rocks, they are scattered through the Silurian and Devonian, and they attained a slight prominence in the Carboniferous. The Paleozoic species number about 20, and they are distinguished from those of the Mesozoic and Tertiary by the less perfect articulation of their valves and lesser degree of ornamentation of the surfaces of their shells. Few Mesozoic species are known and the group is represented in the Tertiary by

about 50 species that show very close relationship to the modern forms.

PLA'GAL CADENCE. See HARMONY, *Cadences*.

PLA'GIAULAX (Neo-Lat., from Gk. πλάγιος, *plagios*, aslant + αὐλαξ, *aulax*, furrow). A genus of Jurassic mammals, typical of the family (Plagiaulacidae), known only from lower jaws fossilized in the English Purbeck beds, which imply an animal of the size of a small rat and representing the primitive multituberculate type of dentition. (See illustration.) It is believed the rodent-like incisor teeth did not grow from persistent pulps, and they have no anterior coating of enamel. The centre of the two molars on each side is hollowed, and the raised rim is beset with tubercles. Associated genera are *Bolodon*, *Allodon*, and *Ctenacodon*, the last named based on lower jaws found in the Laramie formation of Wyoming. Woodward says that the family does not seem to have become extinct until early Tertiary times, for two other genera, *Neo-plagiaulax* and *Ptilodus*, are known from the Lower Eocene of France and New Mexico respectively.



PLAGIAULAX MINOR.

Right lower jaw, showing molars (m) and premolars (p).

PLA'GIOCLASE (from Gk. πλάγιος, *plagios*, oblique + κλάσις, *klasis*, fracture, from κλάν, *klan*, to break). A name originally introduced by Breithaupt and applied by him to the triclinic feldspars of the albite-anorthite series of minerals contained in the feldspar group. See FELDSPAR.

PLAGIOTOMI, plāj'ī-ōs'tō-mī (Neo-Lat. nom. pl., from Gk. πλάγιος, *plagios*, oblique + στόμα, *stoma*, mouth). A suborder of cartilaginous fishes, coextensive with the Selachii. See ELASMOBRANCHII.

PLAGUE (Lat. *plaga*, plague, destruction, injury, blow, from *plangere*, connected with Gk. πλῆσσειν, *plassein*, Lith. *plakti*, to strike, and possibly with Goth. *flōkan*, OHG. *fluohhōn*, Ger. *fluchen*, to curse), BLACK DEATH; BUBONIC PLAGUE; CATTLE PLAGUE, PESTIS; PESTIS BUBONICA; PESTIS INGUINALIS. An acute infectious disease caused by the presence of a specific microbe, *Bacillus pestis*, and characterized by enlargement and suppuration of lymphatic glands.

History. Under BLACK DEATH is given the history of plague to and including the pandemic of 1334 to 1351, when China, India, Persia, Turkey, Russia, Germany, Italy, Greece, France, England, and Norway were devastated and many millions of people died. Proust is authority for the statement that between the eleventh and fifteenth centuries at least 30 minor epidemics of the disease appeared in different parts of Europe. A grave and important epidemic was traced from Syria to Marseilles in 1720, when 86,000 people fell victims to the plague in that city. During the epidemic of 1770-71, which probably passed from Jassy through Kiev, 80,000 persons died in Moscow alone. Early in the nineteenth century Constantinople became the seat of two severe epidemics, one in 1803, with 150,000 deaths, and the other in 1813, with 110,000 deaths. The Balkan Peninsula was visited by the dread disease on several occasions between 1814 and 1841; Greece suffered in 1828, and the southern part of Italy in 1815. Russia,

in the neighborhood of Astrakhan, was swept by an epidemic from 1877 to 1879. While Europe was passing through this period, Africa and Asia were suffering terribly. Kitasato reports 21 epidemics between 1783 and 1844 in Egypt. Tripoli suffered in 1874, as did also Arabia. In the river valleys of the Tigris and the Euphrates outbreaks occurred in 1773, and several subsequently; and as lately as 1876, from which date it raged until 1895. The plague in Persia has been intermittent and of frequent occurrence; perhaps the epidemic of 1876-77 is most noteworthy, because it was the source of the Russian infection in 1877. In India the disease has been endemic for centuries, although reliable and accurate accounts date only from 1815. Its record since that date has been unbroken. Bombay has been a special sufferer since 1896. To trace or chronicle the course and outbreaks of the plague in China would be very difficult. The greatest visitation of the scourge, in 1342 and the following years, has been described. (See BLACK DEATH.) There were outbreaks of the disease in 1850, 1866, 1871, and 1872, and subsequently. The latest pandemic of plague began in 1894 and encircled the globe. Beginning in south-central China, where it had been endemic for centuries, it spread by the tides of travel until it reached the United States. It first invaded Canton, Hongkong, Amoy, and Macao; thence it spread to Japan and Asiatic Turkey; thence to Russia, Austria, and Portugal, in Europe, and to a number of localities in Africa. In 1899 it reached Hawaii, New Caledonia, and the South American countries. Ten years later it appeared in Australia, New Zealand, the Philippines, Germany, and Great Britain; California being infected by way of Hawaii. A few cases made their appearance in Porto Rico and Cuba. During this time the plague raged steadily in India, hundreds of thousands of people dying in some years. During 1912, 47 cases were reported in Porto Rico, with 23 deaths. From this time the disease was under control in the Western Hemisphere, and showed signs of waning in India and other eastern countries.

Cause. Plague is caused by the presence of a specific microorganism, the *Bacillus pestis*, which was discovered independently by Kitasato and Yersin in 1894. It is a small rod, short and thick, with rounded ends that stain more readily than the central portion, showing the pole staining. The bacilli are found in pairs or singly and, in cultures, arranged in chains. They are encapsulated, aerobic, do not form spores, and are nonmotile. They occur in enormous numbers in the smaller glands (buboes), in the spleen, and, after death, in the blood. The unsanitary conditions under which the affected individuals live give ample opportunity for the direct or indirect transmission of the disease from patient to patient by fleas, flies, lice, or other insects. (See INSECT.) The bacillus may enter the body by the skin surface, through cracks or wounds, by the respiratory passages, or by the alimentary canal. The infection is spread chiefly by rats, through the medium of fleas, although other rodents, such as the ground squirrel in California and a species of marmot in Manchuria, may serve either as active disseminators or as reservoirs of the disease. An epidemic of rat plague nearly always precedes an outbreak among human beings, an observation made in Brahmanical medical literature as early as 500 B.C.

Symptomatology. Two forms of plague are described—*pestis major* and *pestis minor*. *Pestis minor* includes various pathological conditions, all of favorable prognosis, presumed to be caused by the plague infections. In the abortive form slight fever, slight swelling of the glands, or local tenderness with trivial systemic involvement constitute the attack. In other cases prostration, headache, vertigo, and gastrointestinal disturbances occur. Those cases occurring in houses in which plague has been found, and during a plague epidemic, are considered to be related to the scourge; but no bacteriological examinations have verified the suspicions. In the tropics these cases are often called climatic bubo. *Pestis major* (the severe or ordinary plague) presents three main clinical types: (1) bubonic, (2) pneumonic, (3) septicæmic. An average attack of bubonic plague presents the following course: The period of incubation lasts from 2 to 10 days. The period of invasion, or prodromal period, varies from 24 to 48 hours in length, and during it the patient suffers with chills, fever, vertigo, headache, and vomiting. Bubo development follows, with staggering gait, tremulous speech, and great restlessness; a temperature of 104° F. or higher; a full pulse, averaging 130 to the minute; a dry, granular tongue covered with a yellow velvety fur, but with a red margin; an anxious and pallid face; constipation; and the enlargement of glands in the neck, groins, or axillæ, constituting the buboes. Following the appearance of the buboes occurs a fall in temperature and pulse rate, generally on the second or third day of the disease. After a short remission the fever ascends to 103° or 105° F., at which point it remains for several days, during which time the bubo reaches its full development. After 10 days the temperature falls. Emaciation and exhaustion are extreme. The patient may die of heart failure, in syncope, or of hemorrhage, of peritonitis, of hyperpyrexia; or he may recover in about two months. The buboes often suppurate, or become necrotic, sometimes involving considerable areas of surrounding tissues. In pneumonic cases foci of broncho-pneumonia are found in the lungs, each focus surrounded by a congested pulmonary tissue. Occasionally the alveoli are found full of sanguinolent fluid which is swarming with plague bacilli.

Prognosis and Mortality. In the majority of cases the prognosis of the disease is extremely unfavorable, much depending on the character of different epidemics. Septicæmic cases are almost always fatal in the colored races, the Caucasian mortality being about 60 per cent; bubonic cases kill 80 or 90 per cent of the colored and about 33 per cent of the whites. The mortality varies in different epidemics. In certain epidemics from one-half to three-quarters of an entire population has perished. In the Hong-kong epidemic of 1894 the mortality was 95 per cent. In Bombay during 1896 and 1897 it was 50 to 60 per cent, while during 1898 to 1901 it averaged 80 per cent. The International Plague Conference considered from the Mukden epidemic of 1910 that the mortality was nearly 100 per cent.

Prophylaxis. As the eliminated bacilli may enter the healthy individual directly by cutaneous infection, by inhalation, or by ingestion (as has been abundantly proved), or may enter indirectly, by means of flies, fleas, rats, etc., it is evident that inspection, isolation, and disinfection

must be employed to prevent or limit an epidemic of plague. The most effective single preventive measure is the thorough extermination of rats, especially when accompanied by rigorous enforcement of house and communal sanitation. The buildings must be made rat-proof, fumigation with hydrocyanic-acid gas is to be instituted, walls and floors are to be washed with phenol disinfecting fluid, etc. The sick must be isolated, infected dwellings fumigated, clothing, bedding, etc., burned. The bodies of the dead should be cremated, or covered with chloride of lime if buried. All excreta should be burned. Isolation of the convalescent should be continued, according to Kitasato, for a month after apparent recovery, plague bacilli being found in the blood three or four weeks after all symptoms have disappeared. Rigid quarantine is necessary during an epidemic. Seaports protect themselves by examining and fumigating all vessels arriving from countries known to be infected with plague. Rats arriving on such vessels may escape to shore and spread infection, and precaution must be taken against this.

Specific prophylaxis may be employed before or during an invasion of the disease by means of Yersin's serum or Haffkine's prophylactic fluid. The serum devised by Yersin is blood serum taken from horses that have been inoculated with the plague bacillus. Hypodermic injection of the serum causes immediate immunity, which lasts only 12 to 14 days. It is therefore suitable to protect members of a family in which a case of plague is discovered. Haffkine's fluid is a culture of the *Bacillus pestis* rendered virulent by special methods, the bacilli, after abundant growth, being killed by an exposure to a temperature of 70° C. for several hours. Inoculation with Haffkine's fluid has the advantage of conferring immunity lasting from a few days to several months. Authorities recommend the provision of Yersin's serum for prompt use in order to arrest an epidemic in the first cases, and the employment of Haffkine's fluid to inoculate the people dwelling in localities threatened with an invasion of the disease.

Treatment. The treatment of plague has been in the past mainly symptomatic. Incision of the bubo should not be made until suppuration is established. But the best (though still unsatisfactory) results have been obtained from the use of Yersin's serum. It has increased recoveries 15 per cent, besides being an unquestioned preventive. It is most effective when injected into the veins. Consult: Rupert Blue, *The Post-Mortem Diagnosis of Plague* (Washington, 1912); F. Neufeld, *Seuchenentstehung und Seuchenbekämpfung* (Berlin, 1914); S. M. Guiteras, "Plague in Havana," in *Journal of the American Medical Association* (Chicago, Jan. 2, 1915), especially the conclusions; R. H. Creel, *Bubonic Plague* (Washington, 1914).

PLAGUE, CATTLE. A disease of cattle. See TEXAS FEVER.

PLAGUES OF EGYPT. A series of miraculous signs and judgments by which, according to Ex. vii. 8-xi. 10, xii. 29, xiv. 26-29, Moses and Aaron proved that they were messengers of Yahwe, Israel's God, and punished the people of Egypt for the King's obstinate refusal to let Israel go into the wilderness to celebrate a festival. Ordinarily the plagues are regarded as 10 in number, viz.: (1) turning the river into blood, (2) frogs, (3) lice, (4) flies, (5) mur-

ain, (6) boils, (7) hail, (8) locusts, (9) darkness, (10) slaying of the first-born. But it is told by many interpreters that the lice (3) and the flies (4) are the same plague and also that the murrain (5) and the boils (6) are only variants; so that it may be assumed that viii. 6-19 and ix. 8-12 are interpolations. On the other hand, Ex. iv. 9 suggests that the turning of water into blood was the third sign, two others having preceded, the change of a rod into a serpent and the serpent into a rod again, and the hand turning leprous and being restored. The omission in our text of the second sign after vii. 13, which Moses had been commanded to perform (iv. 8), may be connected with the numbering of the plagues. Scholars who accept the document theory (see PENTATEUCH) think that in the Yahwist Moses merely proclaimed each sign, which was then wrought by Yahwe. In the Elohist Moses stretched forth his hand and brought the evil upon Egypt, and in the Priests' Code Aaron was told to stretch forth his rod. Following this clew, they infer that the earliest of these sources told of 7 plagues of such a nature as may befall any country, the second of 5 (or 10) plagues, and the third of five plagues characteristic of Egypt. Eerdmans regards the passages ascribed to the Priests' Code as the original groundwork and the rest as interpolations, adding to the number of miracles by which Israel was delivered. It is indeed evident that the text has passed through many vicissitudes. The Samaritan recension contains a number of passages, not found in the Masoretic text, after vii. 18, vii. 29, viii. 19, ix. 19, x. 3, xi. 3. Since they fill obvious gaps in the narrative, and since partial repetition would be natural in this case, some scholars have looked upon these passages as part of the original text. Others have regarded them as additions made by Jewish or Samaritan copyists to render the account smoother. Whether they show that one recension has been expanded or that the other has been condensed, they indicate a process of change that is likely to have gone on since the story was first recorded. The attempt to prove that some of the plagues are based on phenomena natural to the Nile valley cannot be said to be convincing. It has been maintained that especially the so-called Priestly Writer bases his plagues upon the order in which such occurrences would come in Egypt in the course of a year. But it is extremely doubtful whether the story in any form connected the change of the water into blood with the discoloring of the Nile water, as it rises at the end of June. This was not a calamity, but an earnest of great blessings. A pestilence would not select the first-born. To the author each plague was manifestly a fresh miracle. The heaping up of such wonders is a feature often recurring in the apocalypses. A duel between thaumaturgists is also a common motive. Whether the power of the Egyptian magicians, who did not remain nameless (see JANNES AND JAMBRES), to imitate three miracles is a sign of a comparatively early age with its naïve ideas, or of later refinement, can scarcely be decided. Some scholars look upon the paschal rites as the beginning of the whole story. All that opens the womb belongs to Yahwe. The Egyptians refused to let Israel go into the wilderness to offer the first-born of man and beast at the spring festival. Yahwe graciously accepted the blood of the lamb as a substitute for Israel's first-born, as He accepted

the ram for Isaac in the thicket, but exacted from the Egyptians their first-born. This they might have avoided if they had heeded the warning signs. Thus it is supposed that the story attached itself to the tradition of a successful escape from Goshen (q.v.) across the Sea of Sedges to the mountain of Sinai (q.v.).

Bibliography. Commentaries on Exodus by C. F. A. Dillmann (Leipzig, 1880; rev. ed. by V. Ryssel, ib., 1897); B. Bäntsch (Göttingen, 1900); H. Holzinger (ib., 1900); W. H. Bennett (Oxford, 1908); A. H. McNeile (New York, 1908); S. R. Driver (ib., 1911). Consult also: Benjamin Kennicott, *The State of the Printed Hebrew Text of the Old Testament* (Oxford, 1753); J. Popper, *Der biblische Bericht über die Stiftshütte* (Leipzig, 1862); R. A. S. Macalister, in Hastings, *Dictionary of the Bible* (New York, 1900); T. K. Cheyne, in *Encyclopædia Biblica* (London, 1902); Bernhard Luther, in Eduard Meyer, *Die Israeliten und ihre Nachbarstämme* (Halle, 1906); Hugo Gressmann, *Mose und seine Zeit* (Tübingen, 1913).

PLAGUE YEAR, JOURNAL OF THE. An imaginary narrative by Daniel Defoe (1722) of the plague of London in 1665.

PLAICE (OF. *plais*, *plais*, Fr. *plaise*, Sp. *platija*, from Lat. *plattessa*, flatfish, plaice, from Gk. *πλαρίς*, *platys*, flat, Lith. *platus*, broad, Skt. *prthu*, wide, from *prath*, to spread out). 1. A European flounder (*Pleuronectes platessa*) rather broad in proportion to its length; the upper surface of the body and the fins olive brown, marked with large bright-orange spots; a row of similar spots on the dorsal fin and on the anal fin. The plaice inhabits sandy and muddy banks, not in very deep water, feeds on worms, mollusks, small crustaceans, and young fishes, and ordinarily weighs seven or eight pounds. It is taken both by lines and by trawl nets, and its flesh is highly esteemed. 2. In America the name is locally applied to the summer flounder (*Paralichthys dentatus*; see FLOUNDER), an extensive account of which is given by G. B. Goode in *Fishery Industries*, sect. i (Washington, 1884). See Plate of FLATFISH AND FLOUNDERS.

PLAIDEURS, plā'dēr', LES (Fr., The Litigants). The only comedy by Racine (1668). It was suggested by the *Wasps* of Aristophanes, and ridicules the customs and abuses of the French legal profession.

PLAIN (OF. *plain*, from Lat. *planum*, level ground, plain, neut. sing. of *planus*, level, even; connected with Lith. *plānas*, flat, OPruss. *plonis*, threshing floor, OLat. *palma*, Gk. *παλάμη*, *palamē*, flat of the hand, *πλάξ*, *plax*, plain, *πλανάν*, *planan*, to wander, OHG. *flah*, Ger. *flach*, flat, OHG. *fluor*, Ger. *Flur*, AS. *flōr*, Eng. *floor*, OIr. *lār*, floor). An expanse of level or gently sloping land. In contrast with a plateau, the surface of a plain is disposed at a low elevation, usually less than 1000 feet, although no sharp line of division can be drawn between the two. The great plains of the United States have an elevation on the western border of 2000 feet or more. In respect to their origin, plains may be classed as marine, lacustrine, fluvial, and plains of denudation. *Marine plains* are formed by the deposition of sediment beneath the sea. The debris brought down by rivers to their mouths is carried seaward by tides and currents and is distributed over a wide area. Thus in time a broad belt of sedimentary strata accumulates along the margins of continental lands, and these sediments may subsequently be raised into land.

The coastal plain (q.v.), which extends along the Atlantic and Gulf borders of the United States, and the North German plain have been formed in this manner. The marine origin may be demonstrated by the character of the fossils included in the strata. *Lacustrine plains* occupy the basins of former lakes the disappearance of which may have been brought about in various ways. The celebrated Vale of Kashmir in north-western India and the great Hungarian plain are covered with fine sediments that were deposited in bodies of fresh water before the outlets had been cut down. In Nevada and Utah there are extensive lacustrine plains which have been laid bare owing to a change of climate from moist to arid conditions, and similar plains are known to occur in Central Asia. A peculiar type is that illustrated by the valley of the Red River of the North; during the Glacial period a great lake was formed here only to disappear with the retreat of the obstructing ice sheet. (See LAKE; LAKE AGASSIZ.) *Fluvatile plains* are built up by the deposition of silt along the borders and at the mouths of rivers. The Mississippi, the Nile, the Ganges, and most of the large rivers of the world have constructed extensive fluvatile plains. (See DELTA; FLOOD PLAIN.) *Plains of denudation* owe their origin to erosion. When land has acquired considerable elevation above the sea, the surface is dissected by the action of running streams which are constantly engaged in widening and deepening their channels. This process when carried to completion results in the reduction of the divides between the streams, producing a broad lowland whose surface lies but little above sea level. If the former elevations are still indicated by unconsumed hills, the lowland is called a peneplain. The plain thus produced may again be elevated and once more subjected to the process of dissection and base-leveling. The great plain of central Russia and the lowlands bordering the Appalachians have probably been formed in this way. See GEOGRAPHY, PHYSIOGRAPHY.

PLAIN, THE. In the French Revolution, the Moderate party in the Legislative Assembly and Convention, in contradistinction from the Mountain. See MONTAGNARDS.

PLAIN CHANT. A term applied to the ecclesiastical chant of the Roman Catholic church. This style of music was used in the Church from the earliest times. It has certain characteristics which distinguish it from any other known music. All the melodies have a stateliness and quiet dignity rendering them particularly appropriate for the use of the Church. The tempo is moderate, and each melody is written in one of those tonalities known as the Church modes. (See MODES.) For the notation a staff of four lines is used, and the notes are all black and square or lozenge-shaped. For the history and development of this system of plain-chant notation, see MENSURABLE MUSIC; MUSICAL NOTATION.

The origin of plain chant has been the subject of much speculation, but the best authorities now agree that it seems exceedingly probable that the chants of the early Christian Church were either taken directly from or modeled after those of the Hebrews. Plain chant, the only form of music ever officially sanctioned by the Church, never made use of instruments. Even the complicated polyphonic works of the school of the Netherlands and the great Roman school banish instrumental accompaniment. It is only

with the rise of the school of Venice towards the end of the sixteenth century that instruments find their way into the Church. When the plain-chant melodies arose, harmony was utterly unknown, and consequently the whole theory of music turned about melodic progression. Choral singing meant nothing else than singing in unison. As long as the persecutions compelled the early adherents of the faith to worship secretly in the catacombs, it was impossible to establish a universal liturgy. However, the melodies were preserved among the various congregations and were handed down from generation to generation by oral tradition, though we can scarcely doubt that in the course of time the original melodies became somewhat distorted. When, after the conversion of Constantine in 312, Christianity became the state religion, free intercourse between the different congregations became possible. Choirs were formed and received special training, so that congregational singing by degrees disappeared. At the Council of Laodicea in 367 a decree was passed prohibiting any one but the regularly trained singers from singing in church. In the beginning of the fourth century Pope Sylvester established a singing school at Rome, which resulted in the composition of original hymns towards the end of the same century. Some of the oldest of these hymns are attributed to St Hilary, who was Bishop of Poitiers about 335. St Ambrose, Bishop of Milan, who died in 397, devoted all his energies to the arrangement and systematizing of all the then known plain-chant melodies. To him also is ascribed the introduction of the four authentic modes, which he selected from among the seven octave species of Ptolemy, because these four most closely resembled the character of the ancient psalm tones. Although the four authentic modes correspond to the Greek Phrygian, Dorian, Hypo-Lydian, and Hypo-Phrygian modes, the Greek names were discarded and the appellations *protos*, *deuteros*, *tritros*, and *tetartos* substituted. St. Ambrose also composed a great number of original hymns, such as *Deus, creator omnium*; *Æterne rerum conditor*; *Veni, redemptor gentium*; *Jam surgit hora tertia*. See AMBROSIAN CHANT.

After the death of St. Ambrose the original purity of plain-chant melodies was corrupted. When in 590 Gregory I became Pope, Church music was in a deplorable state. Recognizing the fact that music is one of the greatest aids to religion, Gregory began his reforms by establishing the *Schola Cantorum*, which in a very short time rose to become an institution of the highest importance and for centuries preserved the ancient traditions. Since the time of St. Ambrose a large number of new hymns had been composed. The old monotony of the chants had given place to a more varied melody, and this naturally led to an extension of the compass beyond the original fifth. The four original or authentic modes were no longer sufficient. Gregory is credited with having established the four *plagal modes* to meet the demands of the advanced art. Besides, he selected also the chants that were to be sung on every day throughout the Church year. The texts and melodies he ordered to be written in a book called *Antiphonarium*, which was declared to be the absolute authority in matters of Church music. The system of notation employed in this book is that known as Neumes (q.v.), consisting of various signs placed above the syllables without employ-

ment of a staff. After plain chant had thus been reformed it spread with astonishing rapidity over all Europe. Especially Charlemagne was instrumental in promulgating this *Cantus Romanus*; for at diets held at Aix-la-Chapelle in 803 and Diedenhofen in 805 he issued strict orders to introduce this manner of singing in all the dioceses of his Empire and established singing schools in various cities, as Soissons, Toul, Orléans, Cambrai, Lyons, and Dijon. Even before the accession of Charlemagne singing schools had been founded at Fulda and Saint-Gall, but, since new hymns were constantly being written, the purity of the style was almost certain to suffer. Thus in 1323 Pope John XXII was obliged to issue a bull restraining musicians from unlawful innovations. Acting on the recommendation of the Council of Trent, Pope Gregory XIII in 1576 took active steps towards a purification of the style of Church music. But by that time the art of music had made enormous strides; polyphonic music had arisen. Although the new music never had been officially sanctioned, it was not only tolerated but was favored. Composers took the old plain-chant melodies as a *cantus firmus* for the tenor, against which the other voices were set contrapuntally. Many composers had little scruple in distorting the original melodies to suit their purpose. But a greater danger to Church music arose from the fact that it became customary to substitute popular secular melodies for the plain chant. At this time Palestrina established the true polyphonic Church style. This is founded on the Church modes; simplicity and noble dignity are its fundamental principles, as they ever have been the principles of plain chant. Since the time of Palestrina no new melodies have been added to the large stock of plain chant. Composers have devoted their talents to polyphonic music, but the old plain-chant melodies have remained in constant use up to the present day. The custom at high mass is to sing the *Kyrie*, *Gloria*, *Credo*, *Sanctus*, and *Agnus Dei* in polyphonic or modern harmonic style with instrumental accompaniment. The Introit, Gradual, Tract (or Sequence), Offertory, and Communion, if sung by the choir, are sung in unison to the old plain-chant melodies, to which the organ supplies the harmonies strictly in accordance with the rules governing the Church modes. The *Sursum corda*, Preface, and *Paternoster* are set to the ancient unvarying melodies.

The advance of musical archaeology during the past century has done much towards the restoration of the plain-chant melodies to their original purity. In the earlier centuries the execution of the old melodies was handed down by tradition, and that there was a remarkable uniformity is proved by the existence of a few manuscripts coming from places far apart. Corruption began with the invention of printing. Unfortunately the *Editio Medicea* in 1614 received the official sanction of the Vatican, and for three centuries the old plain-chant melodies were used and known in disfigured and considerably mutilated form. About the middle of the last century Lambillotte in France and Hermesdorff in Germany began to study the old manuscripts. The archbishops of Rheims and Cambrai became interested and introduced a movement for an edition based on the old manuscripts. Strange to say, these attempts aroused suspicion in Vatican circles, and in 1871 Pius IX once more sanctioned the *Editio Medicea*, which with all

its corruptions was issued again at Ratisbon from 1871 to 1881. Nevertheless, despite the papal edict, scholars continued their researches. Especially the Benedictines of Solesmes, under the able leadership of Guéranger, Pothier, and Mocquereau, devoted their energy to this problem of restoration. In 1889 Mocquereau (q.v.) began the quarterly publication of the famous *Paléographie Musicale*, which issues photographic reproductions of the old manuscripts with historical and critical comments. Widespread interest was aroused in 1890 by the publication of Gevaert's (q.v.) *Les origines du chant liturgique*, in which the whole Gregorian tradition was attacked with weighty arguments. Five years later the same scholar published *La mélodie antique*, in which he seemed to strengthen his original position. After careful examination of Gevaert's points by such scholars as Peter Wagner, Gastoué, Frère Houdard, and Riemann, it seems that in some of his conclusions Gevaert went too far. But all authorities now agree that the far-reaching reform of plain chant, while vigorously carried on by Gregory I, had begun before his time and also was continued after his death. The result of all this investigation was that in 1904 Pius X officially withdrew the sanction from the *Editio Medicea* and commanded a new edition, the *Editio Vaticana*, to be made from the original manuscripts. Moreover, the texts of this new edition must agree with those published by Mocquereau in the *Paléographie*.

Bibliography. J. H. Cornell, *Manual of Roman Chant* (Baltimore, 1860); F. X. Haberl, *Magister Choralis: A Theoretical and Practical Manual of Gregorian Chant* (trans. from 4th Ger. ed. by N. Donnelly, New York, 1877); John Singenberger, *Short Instructions in the Art of Singing Plain Chant* (ib., 1880); Joseph Pothier, *Les mélodies grégoriennes d'après la tradition* (Tournai, 1880); F. A. Gevaert, *Les origines du chant liturgique de l'église latine* (Brussels, 1890); id., *La mélodie antique dans le chant de l'église latine* (Ghent, 1895); G. L. Houdard, *L'Art dit grégorien d'après la notation neumatique* (Paris, 1897); Thomas Helmore, *Plain Song* (London, 1900); A. Dechevrens, *Les vraies mélodies grégoriennes* (Paris, 1902); A. Fleury, *La restauration grégorienne* (ib., 1905); H. Beverunge, "The Vatican Edition of the Plain Chant," in the *Irish Ecclesiastical Record* (Dublin, 1906); N. Rousseau, *L'Ecole grégorienne de Solesmes* (Tournai, 1910); A. Gastoué, *L'Art grégorien* (Lyons, 1911); P. J. Wagner, *Einführung in die gregorianischen Melodien* (3d ed., Leipzig, 1911; Eng. trans. of 2d ed., London, 1901); A. Gataud, *La musique grégorienne* (Paris, 1913).

PLAIN DEALER, THE. A comedy by William Wycherley, produced in 1674, printed in 1677. The plan was taken from Molière's *Le misanthrope*, but the tone of this repulsive story is quite different.

PLAINFIELD. A town including several villages in Windham Co., Conn., 16 miles north-east of Norwich, on the Quinebaug and Moosup rivers and on the New York, New Haven, and Hartford Railroad (Map: Connecticut, H 3). It has public libraries at Moosup and Plainfield villages, and in Plainfield village is the old Plainfield Academy, which was one of the best known in New England towards the close of the eighteenth century. The chief industrial establishments include large cotton and woolen mills,

thread and yarn factories, a foundry, wood-working mills, and wagon shops. The government is administered by town meetings. Plainfield, originally called Quinebeag, was settled about 1691 and was organized as a town in 1699. Pop., 1900, 4821; 1910, 6719.

PLAINFIELD. A city in Union Co., N. J., 24 miles west by south of New York City, of which it is a residential suburb, on the Central Railroad of New Jersey (Map: New Jersey, D 2). It is picturesquely situated at the base of the steep wooded ridge known as First Mountain, is well laid out, contains many beautiful homes, and has public parks, the Muhlenberg Hospital, a large public library, two country clubs, and many fraternal and social organizations. Plainfield is also an important industrial centre, its manufactures including printing presses, machine tools, silk and cotton goods, kid gloves, silver-plated ware, clothing, lumber products, carriages, etc. Pop., 1900, 15,369; 1910, 20,550; 1914 (U. S. est.), 22,755.

PLAINS INDIANS. A general name for the tribes occupying the Missouri basin. See INDIANS.

PLAIN'TIFF (OF. *plaintif*, complaining, from *plainte*, complaint, from Lat. *planctus*, lamentation, beating of the breast in grief, from *plangere*, to strike). Under the common-law system of pleading and modern codes, the person who institutes a civil action or proceeding against another, the latter being called the defendant. Where a proceeding is commenced by petition, as in a surrogate's court, the moving party is usually called the petitioner. In many jurisdictions a party commencing an action in equity is called the complainant, but under the reformed procedure no distinction of this sort is made. A plaintiff may be one who prosecutes an action on his own behalf, or who does so as a representative for the benefit of another, in which case he adds to his name a description of his official or representative capacity, as "A, guardian ad litem of B, an infant, etc."

A person who brings an action in a representative capacity is sometimes called a plaintiff ad litem. A person who maintains a proceeding or action in an admiralty court is called a libellant. See PARTIES; and consult the authorities referred to under PLEADING.

PLAINVIEW. A town and the county seat of Hale Co., Tex., about 320 miles northwest of Dallas, on the Panhandle and Sante Fe Railroad (Map: Texas, B 2). It is the seat of the Seth Ward Methodist College and the Wayland Baptist College, and it contains an Elks home, Masonic Temple, city hall, courthouse, and a sanitarium. The town is situated in a productive farming, fruit-growing, live-stock and cattle-raising region. The water works are owned by the municipality. Pop., 1910, 2829.

PLAINVILLE. A town in Hartford Co., Conn., 5 miles west by north of New Britain, on the New York, New Haven, and Hartford Railroad (Map: Connecticut, D 3). The manufacture of electrical supplies constitutes the chief industry. Pop., 1900, 2189; 1910, 2882.

PLAN (for derivation see PLANE). A diagram or drawing representing an object as if seen from directly above every part of it. Plans of buildings, ships, machinery, etc., are drawn to represent horizontal sections of the object taken at given levels, except roof plans, deck plans, etc., which represent the aspect of the uppermost surfaces as seen from above. In

architecture the various floor plans (foundation plan, cellar plan, first, second, third floor plan, etc.) show the disposition of all the supports, piers, walls, partitions, etc., as well as the arrangement and dimensions of rooms, halls, etc. Special plans are drawn to show arrangement of plumbing, ventilating apparatus and ducts, electric wiring, etc. Plans are drawn to specified scales, as $\frac{1}{8}$ of an inch to the foot, 2 centimeters to the meter, etc. For the complete presentation of the design and construction of a building, a ship, or a machine the plans are supplemented by elevations and vertical sections, and details to a larger scale.

PLANA, plā'nā, GIOVANNI ANTONIO AMEDEO, BARON (1781-1864). An Italian astronomer and mathematician, born at Voghera in Lombardy. He was educated at the Ecole Polytechnique in Paris. He held the chair of mathematics at the Alessandria artillery school from 1803 till 1811, and in the latter year became professor of astronomy at the University of Turin. In 1813 he was made director of the Turin observatory. He made numerous contributions to mathematics and astronomy, his most important works being *Memoria sulla teoria dell' attrazione degli sferoidi ellittici* (1811) and *Théorie du mouvement de la Lune* (2 vols., Turin, 1832). He was a member of the French Academy and received the grand prize in mathematics in 1820 and the Lalande medal in 1828.

PLANARIA (Neo-Lat. nom. pl., from Lat. *planarius*, flat). *A genus of platyhelminthes (flatworms) characterized by having a flat oval body covered with cilia. They live in fresh water. See FLATWORM; FLUKE; TAPEWORM; ETC.

PLANCHÉ, plān'shā', JAMES ROBINSON (1796-1880). An English playwright and antiquary, born in London, Feb. 27, 1796. He wrote for the London theatres more than 200 successful pieces. His first play was a burlesque, *Amoroso, King of Little Britain* (1818); his last was *King Christmas*, a masque (1871). He was at the height of his reputation from 1840 to 1850, when he was bringing out his burlesques and Christmas pieces for Madame Vestris at the Lyceum. Planché had already gained a reputation for his knowledge of costume and heraldry. In 1829 Planché was elected fellow of the Society of Antiquaries and in 1843 was one of the founders of the British Archaeological Society, to which he contributed many papers. In 1866 he was made Somerset herald. He died at Chelsea, May 30, 1880. Among his valuable works are *Costumes of Shakespeare's King John* (1823-25); *The History of British Costumes* (1834); *Regal Records* (1838); *The Pursuivant of Arms, or, Heraldry Founded upon Facts* (1852); *A Cyclopædia of Costume* (1876-79). In 1879 appeared *Extravaganzas* in five volumes and in 1881 *Songs and Poems*. Planché also published collections of fairy tales translated from the French and the German. Consult his *Recollections and Reflections* (London, 1872).

PLANCHE, plānsh, JEAN BAPTISTE GUSTAVE (1808-57). A French critic. He was born in Paris, was educated at the Collège Bourbon, and in 1831 began contributing to the *Revue des Deux Mondes*. He was subsequently connected with the *Journal des Débats* (1832) and was an associate of Balzac on the *Chronique de Paris*. He bitterly attacked the works of Victor Hugo and other writers of the Romantic school. His works include *Portraits littéraires* (1836), *Nou-*

veaux portraits littéraires (1854), and *Études sur les arts* (1855).

PLANCHETTE, plān'shét' (Fr., little board). A small triangular board mounted on two wheels, with a pencil fastened at the apex to form the third support. If it is placed upon a table with a sheet of paper under it, and if one or two persons with the necessary qualifications lay their hands lightly upon it, it begins to move and sometimes may write answers to questions. These answers are asserted by believers in spiritualism to be communications from the spirit world.

PLANCK, plāpk, KARL CHRISTIAN (1819-80). A German philosopher, born at Stuttgart and educated in philosophy and theology in Tübingen. In 1844 he became tutor and librarian at the theological seminary there and lecturer on philosophy at the university. From 1856 to 1869 he was professor at the Gymnasium of Ulm, and in 1879 he became principal of the seminary in Maulbronn. Planck defends in his numerous writings the speculative system of philosophy as opposed to that of empiricism. His chief work is *Die Weltalter* (1850), in which he treats of the system of pure realism and subjective idealism. His *Katechismus des Rechts* (1852) is one of the first philosophical books to acknowledge the importance of the social question. In his *Wahrheit und Flachheit des Darwinismus* (1872) he takes his stand against Darwin's theory of evolution, and in *Anthropologie und Psychologie auf naturwissenschaftlicher Grundlage* (1874) he vigorously combats the theories of the atomists and materialists.

PLANCK, MAX (1858-). A German physicist, born in Kiel and educated at the universities of Munich and Berlin. He became docent at Munich in 1880, professor at Kiel in 1885 and in 1889 at Berlin, where he was later appointed professor of mathematical physics and director of the Institute of Theoretical Physics. In 1913-14 he was rector of the university. His great work was in theoretical physics, especially energetics and thermodynamics, and his name is connected with a radiation (q.v.) formula and with the theory of a quantum of energy, viz., that energy is "not emitted continuously but in discrete atomic quantities." He wrote, among other works: *Das Prinzip der Erhaltung der Energie* (1887; 3d ed., 1913); *Vorlesungen über Thermodynamik* (1897; 4th ed., 1913; Eng. version by Ogg, 1903; Fr., 1913; Russ., 1900); *Vorlesungen über Theorie der Wärmestrahlung* (1906; 2d ed., 1913; Eng. version, 1914); *Vorlesungen über theoretische Physik* (1910; lectures delivered in 1909 at Columbia University). He edited some of Kirchhoff's and Helmholtz's writings for Ostwald's *Klassiker der exakten Wissenschaften*.

PLANCK'S LAW. See RADIATION.

PLANÇON, plān'sōn', POL (1854-1914). A French basso, born at Fumay in the Ardennes. He was sent to Paris by his parents and there, despite his own inclinations, entered a business house. Through the friendship of Theodor Ritter he was enabled to study music and finally entered the École Duprez and devoted himself entirely to music. In 1881 he made his début in *Les Huguenots* at Lyons. Two years later he appeared at the Paris Grand Opéra as Mephisto in *Faust*, in which rôle, as well as that of Ramfis in Verdi's *Aida*, his success was pro-

nounced. He created the rôles in Saint-Saëns's *Ascanion*, in Massenet's *Le Cid*, and in Gounod's *Sapho*, upon its revival in 1893. From 1893 to 1904 he was a member of the Metropolitan Opera House in New York, where he was a prime favorite. He died in Paris.

PLAN'CUS, LUCIUS MUNATIUS. A Roman politician and soldier. He was born at Tibur, near Rome. In youth he was one of Cicero's pupils in oratory and later was an officer of Cæsar in the Gallic wars. After the assassination of Cæsar Plancus at first favored Brutus, but soon went over with four legions to Antonius. In 42 B.C. he was consul with Lepidus. In the contest between Antonius and Octavianus he sided with the latter and in January, 27 B.C., made the motions as the result of which in the Senate the title of Augustus was conferred on Octavianus. Plancus was a man of some literary taste, and to him one of Horace's odes (i, 7) is addressed.

PLANE (Lat. *planum*, level ground, plain, neut. sing. of *planus*, level, flat, plane, plain). A surface which is determined by any three of its points not in a straight line. It may also be defined as a surface such that a straight line placed anywhere upon it will lie wholly within it, or as a surface described by a straight line which passes through a fixed point and always touches (crosses) a fixed straight line. A plane surface is said to have zero curvature. When two planes intersect their intersection is a straight line. The inclination of one plane to another, or the dihedral angle (see ANGLE) between the planes, is measured by the plane angle whose arms lie in the respective planes and are perpendicular to their intersection. When this angle is a right angle the planes are perpendicular to each other. As a result of the definition, a plane is determined by a straight line and a point not in that line, or by two intersecting lines or by two parallels. A group of several planes having a common line of intersection is called an axial pencil. Several planes with a common point of intersection are called a sheaf of planes.

Plane Figures. Any combination of coplanar points and lines is called a plane figure. See POLYGON.

PLANE (OF., Fr. *plane*, from Lat. *platanus*, from Gk. *πλάτανος*, plane tree, from *πλατύς*, *platys*, flat, Lith. *platus*, Skt. *prthu*, broad, from *prath*, to spread out; so called from the broad flat leaves), *Platanus*. The only genus of the family *Platanaceæ*, tall large trees, of which there are six or seven species. The flowers are in globose, small, pendulous, long-stalked catkins, which give the tree a peculiar appearance in winter. The species of plane are natives of temperate climates in the Northern Hemisphere; have deciduous large palmate leaves and smooth whitish bark, which annually scales off in large pieces. The Oriental plane (*Platanus orientalis*), a native of Greece and the East, early used by the Greeks and the Romans as an ornamental tree, is extensively planted for shade and ornament in various regions. Few trees better endure the atmosphere of large cities. A tree is reported on the banks of the Bosphorus, which is 141 feet in circumference at the base, extends its branches 45 feet from the trunk, and is believed to be more than 2000 years old. The wood of the plane, when young, is yellowish white; when old, it is brownish, fine-grained, takes a high polish, and is esteemed for cabinet-

making. The tree thrives best in a rich alluvial soil in the vicinity of water. The North American plane, sycamore or buttonwood (*Platanus occidentalis*), is very similar and is probably the largest deciduous tree of the United States. It abounds on the banks of the great rivers



PLANE TREE OR BUTTONWOOD.

of the Middle States, where it attains a height of 100-150 feet and 10-15 feet in diameter. Its timber is not very valuable and is liable to decay. Two other species occur in the Southwest, the Californian sycamore (*Platanus racemosa*) and the Arizona sycamore (*Platanus wrightii*). The name "plane tree" is commonly given in Scotland to the sycamore or great maple (*Acer pseudo-platanus*), which resembles the plane tree in its foliage. See MAPLE.

PLANE (Fr. *plane*, from ML. *plana*, plane, from Lat. *planare*, to plane, level, from *planus*, level, flat, plane, plain). A tool used for rendering the surface of wood smooth and level. It consists of an oblong block of wood or metal with an opening through the centre; this opening is square on the upper side and is always large enough to admit the cutting instrument; it diminishes down to a mere slit on the underside, just wide enough to allow the cutting edge of the plane iron and the shaving of wood which it cuts off to pass through. The essential part of the tool is the plane iron, a piece of steel with a chisel-shaped edge and a slot in its centre for a large-headed screw to work and to attach to it a strengthening plate. In the older wooden planes it was held in place by a hardwood wedge. By driving in the wedge the irons are held very firmly in their place, and they are so adjusted that only the fine sharp chisel edge of the cutting tool projects through the slit in the bottom of the body of the plane, so that when the tool is pushed forward by the force of the hand the cutting edge pares off all irregularities until the wood is as smooth as the undersurface of the plane. In the iron planes the iron is held in the block and adjusted by a screw. There are many modifications in this tool, which can have its cutting edge and undersurface made to almost any contour, so that moldings of all kinds may be made. The two commonest are the jack plane, for rough work, and the smoothing plane, for finishing off plane surfaces. For planing machines, see METAL-WORKING MACHINERY; WOOD-WORKING MACHINERY.

PLANE CURVE. See CURVE.

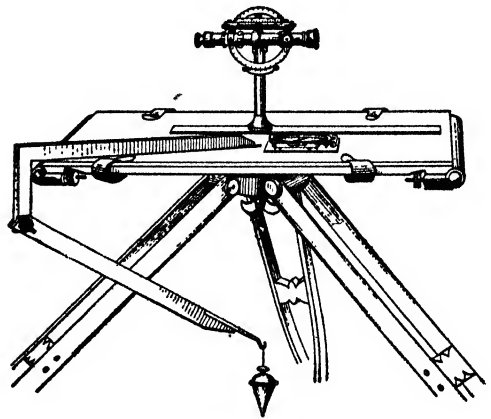
PLANE OF CLEAVAGE. See CLEAVAGE OF CRYSTALS.

PLANE OF POLARIZATION. See LIGHT.

PLANNER TREE, or WATER ELM (named in honor of J. S. Planer, a German botanist of the eighteenth century). A moderate-sized elm-like tree (*Planera aquatica*), found on swampy lands from North Carolina to southern Indiana, Missouri, and south to Florida and Texas. The wood is soft, close-grained, and not strong.

PLANE SAILING. See SAILINGS.

PLANE TABLE. An instrument used to fill in the details of topographical work (see SURVEYING), and, on account of the ease and rapidity with which it can be operated, popular where only a moderate approach to accuracy is required. The plane table consists essentially of a mounted drawing board bearing an alidade or ruler surmounted by a telescope whose line of sight is parallel in azimuth to the ruler. In orienting the table a declinator, or compass box, and a plumbing arm serve to place a given point on the table over that on the ground which it represents and to cause a line of the drawing on a paper mounted on the board to lie in or parallel to the vertical plane through its counterpart on the ground. After the paper has been attached to the table it is then leveled and oriented as already described. The observer then sights successively at other different objects in the area under survey, revolving the telescope and ruler in azimuth and drawing corresponding lines along the edge of the ruler at each position. All of these lines pass through the given point and give the angular direction of the different objects in the field. The plane table is then taken to a second station located at some place previously sighted and whose distance from the first can be measured by stadia, chain, or tape, and is there set up and oriented as before. The distance from the first station to the second is set off at the desired scale on the line connecting the two points, and the telescope is directed at the same objects as were sighted at from the first station, as well as



PLANE TABLE.

others not visible from the first point, and new lines are ruled. The instrument is then taken to other points which are given by the intersection of the various lines ruled on the paper, and the positions of the various objects in the area under survey are determined. In this

way it is possible to fill in the detail work of a topographical survey with great rapidity and sufficient exactness for most map work. Consult: "Plane Table Manual," in *United States Coast and Geodetic Survey, Report* (Washington, 1897); H. S. Gannett, "Manual of Topographic Methods," in *United States Geological Survey, Bulletin 307* (ib., 1906); H. M. Wilson, *Topographic Surveying* (3d ed., New York, 1910); Johnson and Smith, *Theory and Practice of Surveying* (17th ed., ib., 1911). See SURVEYING.

PLAN'ETARIUM (Neo-Lat., from Lat. *planeta*, from Gk. *πλανήτης*, *planētēs*, wanderer, wandering star, planet, from *πλανήs*, *planēs*, wanderer, planet, from *πλάνη*, *planē*, a wandering; connected with Lith. *plónas*, thin, Lat. *planus*, level, flat, plane, plain). A machine much employed by astronomers in the seventeenth and eighteenth centuries and first constructed by Huygens and Römer for the purpose of exhibiting clearly the motion of the heavenly bodies in conformity with the Copernican doctrine. The planetarium exhibited only the orbital motions of the planets about the sun, either in circles or ellipses, and with constant or varying motions, according to the perfection of the machine.

PLAN'ETARY GEAR, IN MOTOR VEHICLE. See MOTOR VEHICLE.

PLAN'ETES'IMAL HYPOTHESIS. See COSMOGONY.

PLAN'ETOIDS (from Gk. *πλανήτης*, *planētēs*, wanderer, wandering star, planet + *εἶδος*, *eidos*, form), or **ASTEROIDS**. A numerous group of very small planets which with one exception travel in orbits lying between those of Mars and Jupiter. Till the first year of the nineteenth century they remained undiscovered, but for several years their existence had been suspected, mainly owing to the remarkable hiatus in the series of the planetary distances when compared with the law of Bode (q.v.). On the first day of January, 1801, the first and largest of them, Ceres, was detected by Piazzi at Palermo, and his success roused the astronomers to search for more planets. Their search was successful, for Olbers (q.v.) discovered two, Pallas and Vesta, in 1802 and 1807 respectively, and Harding found Juno in 1804; but as all researches for some time subsequent to 1807 were unavailing, astronomers gradually allowed themselves to settle down into the belief that no more planetoids remained to be discovered, when the detection of Astræa by Hencke in 1845 revived the hope of fresh discoveries, and from this period no year (excepting 1846) has passed without adding to the list. And since the application of photographic processes to observation, the number known to astronomers has increased with great rapidity. The first photographic planetoid was found by Wolf, of Heidelberg, Germany, in 1891, and was named by him Brucia, in honor of Katharine W. Bruce, who contributed to the Heidelberg observatory. Brucia received the number 323 in the list of planetoids. The photographic method of discovery is very simple. The camera carrying the sensitive plate is attached to an equatorial telescope and is thus kept pointed at a particular part of the heavens during the necessary lengthy time of exposure. Consequently the stars in the field are registered on the plate as points, while the planetoids, which have shifted their positions among the stars during the exposure,

plate. An important modification in technique was introduced by the Rev. Joel Metcalf, of Winchester, Mass., who, by giving an additional motion to the camera, secured point images of the planetoids and trail images of the stars. On account of the large number of planetoids which are reported as new every year, it has been customary since 1892 to designate them provisionally at first by the letters AA, AB to AZ, BA, etc. to ZZ, preceded by the number of the year. As soon as the elements of its orbit have been calculated and it is quite certain that it is not one of those already known, the planetoid is given a number and sooner or later a name. Photography has now almost completely replaced the visual telescope in the observation of planetoids. Since 1892 only a few planetoids have been found visually, though the total in the list has been extended from 322 to over 800.

The magnitudes of the planetoids have not been very accurately ascertained, but it is certain that they are exceedingly small compared even with Mercury, the smallest of the other planets, the diameter of the largest among them having been measured by Barnard as 480 miles, while most of the others are very much smaller than this. They also differ, generally speaking, from the rest of the planets in other respects; their orbits are of greater eccentricity, are inclined to the ecliptic at a greater angle, and are interlaced in a most intricate manner, crossing each other so frequently as to form, when viewed perpendicularly, a kind of network. The orbit of 475 Oeclo is 0.38, or nearly double that of Mercury, while the average eccentricity for the whole family is more than twice that of the orbits of the major planets. The inclinations of their orbits to the ecliptic also vary considerably; the greatest is 34° 42', in the case of Pallas, while more than 30 per cent exceed 20°.

The distribution of the planetoids in the belt which they occupy between the orbits of Mars and Jupiter is far from uniform. Several marked gaps are found, and it was first pointed out by Kirkwood that they occur where the period of a planetoid would be an exact fraction of the period of Jupiter, to whose perturbative action they are doubtless due. After the first two or three of these bodies had been discovered the opinion was propounded by Olbers that they were but the fragments of some large planet, and this hypothesis received corroboration from the intimate connection which was shown to subsist among them; but this hypothesis is now rejected by most astronomers, and their existence is explained by the nebular hypothesis. See NEBULÆ.

Decidedly the most interesting planetoid is the one discovered Aug. 13, 1898, by Witt of Berlin, which has received the number 433 and the name Eros (q.v.). This small planet possesses the remarkable orbital peculiarity that at perihelion it passes considerably within the orbit of Mars and thus approaches the earth nearer than any other known body except the moon and is therefore especially well suited for the determination of solar parallax by the planetoid method. See ASTRONOMY; PARALLAX.

PLAN'ETS (for derivation see the article PLANETARIUM). Those solid spherical bodies which belong to our solar system and revolve in elliptic orbits round the sun. The name "planet" is of considerable antiquity and was applied to these dependents of the sun to dis-

which stud the sky and present to the naked eye no indication of change of relative place (see STARS), while the planets seem to wander about among them. The planets at present known are, in the order of their distance from the sun, Mercury, Venus, the earth, Mars, the planetoids, Jupiter, Saturn, Uranus, and Neptune. Six of these, Mercury, Venus, the earth (which was not, however, then reckoned a planet), Mars, Jupiter, and Saturn, were known to the ancients; Uranus was discovered by Sir William Herschel (q.v.) in 1781; and Neptune, after having its position and elements determined theoretically by Leverrier and Adams, was discovered by Galle in 1846. The planetoids, of which over 800 are now known, have all been discovered since Jan. 1, 1801. Six of the planets, the earth, Mars, Jupiter, Saturn, Uranus, and Neptune, are attended by one or more satellites. Uranus (generally), Neptune, almost all the planetoids, and all the satellites except our moon, are invisible to the naked eye. The visible planets can be at once distinguished from the fixed stars by their clear, steady light, while the latter have a sparkling or twinkling appearance. The comparative proximity of the planets may be proved by examining them through a telescope of moderate power, when they appear as round luminous disks, while the fixed stars show as mere points of light even in the most powerful telescopes. The planets as observed from the earth move sometimes from west to east, sometimes from east to west, and at times remain stationary at the point where the apparent motion changes from the one direction to the other. This irregularity in their movements was very puzzling to the ancient astronomers, who invented various hypotheses to account for it. (See PROLEMAIC SYSTEM; EPICYCLE.) The system of Copernicus, by assuming the sun, and not the earth, as the centre of the system, explained with admirable simplicity what seemed before a maze of confusion, by showing that the planetary *apparent* motions are merely a result of real motions belonging to the planets in general and to the earth carrying the observer.

The planetary orbits differ considerably in their degrees of eccentricity, those of Mars, Mercury, and many of the planetoids being most, and those of the larger planets least, eccentric. No two planets move exactly in the same plane, though, as a general rule, the planes of the larger planets most nearly coincide with that of the ecliptic. The latter are consequently always to be found within a small strip of the heavens extending on both sides of the ecliptic (q.v.), while the others have a far wider range. Pallas, one of the planetoids, has an angular elevation of orbit equal to $34^{\circ} 42'$ above the ecliptic. According to Kepler's laws (see ASTRONOMY), the nearer a planet is to the sun the shorter is the time of revolution. The arrangement of the planets in the solar system bears no known relation to their relative size or weight, for though Mercury, Venus, and the earth follow the same order in size and distance from the sun, yet Mars, which is farther from the sun, is much smaller than either the earth or Venus; and the planetoids, which are still farther off, are the smallest of all. Jupiter, which is next in order, is by far the largest, being about one and one-half times as large as all the others together; and as we proceed farther outward the planets become smaller and smaller.

With reference to their distance from the sun, as compared with that of the earth, the planets are divided into *superior* and *inferior*; Mercury and Venus are consequently the only inferior planets, all the others being superior. The inferior planets must always be on the same side of the earth as the sun is and can never be above the horizon of any place (not in a very high latitude) at midnight; they are always invisible at their superior and inferior conjunctions, except when, at the latter, a transit (see TRANSIT OF VENUS) takes place. The superior planets are likewise invisible at conjunction, but when in opposition they are seen with the greatest distinctness, being then due south at midnight.

In 1859 Leverrier put forward the hypothesis of an intra-Mercurial planet in order to explain the advance of the perihelion of Mercury, and the name Vulcan (q.v.) was assigned to it. Although its discovery has been reported several times, the most careful photographic search during recent solar eclipses has failed to confirm its existence. At the other extreme of the solar system the existence of one or more planets revolving outside the orbit of Neptune has been suggested to account for certain perturbations of Uranus and Neptune which cannot be attributed to the known members of the solar system. Even before the discovery of Neptune it was suggested that the Uranian disturbances were not due to a single exterior planet alone. Todd, Pickering (qq.v.), and others have investigated the question and have even computed the masses and distances of these ultra-Neptunian planets, but every effort to find them has so far proved fruitless.

In astronomical tables, almanacs, etc., the planets are for convenience denoted by symbols instead of their names, as follows: Mercury, ☿; Venus, ♀; the earth, ♂; Mars, ♂; the planetoids, in the order of their discovery, ①, ②, ③, etc.; Jupiter, ♃; Saturn, ♄; Uranus, ♅; Neptune, ♆; the sun, ☉; the moon, ☾.

For a table of the periods, distances, size, density, etc., of the planets, see SOLAR SYSTEM. See also the several planets under their respective names. For the elements necessary to determine the orbit of a planet, see ORBIT. For theories regarding the origin of the system, see COSMOGONY; NEBULÆ.

Bibliography. Grant, *History of Physical Astronomy* (London, 1852); C. A. Young, *Text-book of General Astronomy* (new ed., New York, 1898); G. P. Serviss, *Other Worlds* (ib., 1901); Percival Lowell, *The Solar System* (Boston, 1903); C. L. Poor, *The Solar System* (New York, 1908); R. S. Ball, *Story of the Heavens* (ib., 1910); Harold Jacoby, *Astronomy* (ib., 1913).

PLANIMETER (from Lat. *planum*, level ground, plain + Gk. *μέτρον*, *metron*, measure). An instrument for automatically measuring the areas of maps and plans. The first usable planimeter seems to have been constructed in 1814 by a Bavarian engineer named Hermann (1785-1841). This was followed by an ingenious device invented by a Swiss engineer, Oepikoff, in 1827 and perfected 10 years later by Ernst of Paris. The next notable type was the polar planimeter made by the firm of Amsler-Laffon of Schaffhausen (1854) and known as Amsler's planimeter. This well-known instrument consists of two arms hinged at one end, the outer end of one being a pointed support and that of the other a tracing pencil. The

latter arm also bears a graduated cylinder which rolls on the paper, its axis being parallel to the arm. To obtain the area of a figure the instrument is moved bodily about the pointed support on the first arm, while the tracer of the other arm describes the perimeter of the area, and the graduated cylinder records the required area. This and the Wetliische linear planimeter, manufactured in Vienna, are the best planimeters now made. The mathematical principles involved may be found in works on surveying. The best description of the Amsler planimeter is given in C. M. von Bauernfeind, *Elemente der Vermessungskunde* (7th ed., Stuttgart, 1890). Consult also Amsler, *Ueber die mechanische Bestimmung des Flächeninhalts* (Schaffhausen, 1856). The latest improvements on the polar planimeter have been made by Hohmann and Coradi in their Präzisions-Polarplanimeter and by Coradi in his Kugel-Rollplanimeter, on which consult *Das Momentenplanimeter* (Zürich, 1875); Lorber, in *Zeitschrift für Vermessungswesen*, vols. viii and xvii (Stuttgart, 1884-88); Amsler-Laffon, "Planimeterkonstruktionen," in the *Zeitschrift für Instrumentenkunde*, vol. iv (Berlin, 1884). For the history of the subject, consult Christopher Trunk, *Die Planimeter; deren Theorie, Praxis und Geschichte* (Halle, 1865), and Favaro, in the *Allgemeine Bauzeitung* (Vienna, 1873).

PLANIMETRY (from Lat. *planum*, level ground, plain + Gk. *-metra*, *-metria*, measurement, from μέτρον, *metron*, measure). That portion of geometry which treats of the measurement of plane areas. See MENSURATION; PLANIMETER.

PLANING MACHINE, or **PLANER**. See METAL-WORKING MACHINERY; WOOD-WORKING MACHINERY.

PLANKTON (Neo-Lat., from Gk. *πλαγκτός*, *planktos*, wandering, from *πλάειν*, *plazein*, to wander). A collective term for the free floating or swimming organisms in oceans, lakes, or rivers. The oceanic plankton is more interesting and important than that of lakes and of rivers, inasmuch as it forms the basis for all oceanic life. Among the more important forms which are found in the plant plankton are blue-green algæ, bacteria, and diatoms. The colors of certain waters are due to plankton organisms. For example, the Red Sea is colored by a red alga. Diatoms are found in especial abundance in the colder seas. Among the more interesting structures and life habits of the plankton plants there may be noted a high development of adaptations for active movements through the water, a type of structure which is found in plants only among the lower forms. Another very striking feature of the plankton is its periodicity; at various seasons its constitution varies widely and the plankton organisms are known to rise and sink more or less periodically. The mechanism involved in these movements is not known.

In zoölogy the term is restricted to the pelagic life which drifts, the actively swimming surface forms constituting a separate assemblage—the nekton. It consists mainly of jellyfishes (Medusa, Siphonophora, and Ctenophora), ascidian, especially the salpæ (q.v.), and a great variety of pelagic larvæ and minute crustacea with feeble powers of locomotion that are carried along almost passively by the oceanic currents. Much of this occurs in innumerable flocks and sometimes tinges large areas of the sea by its color or causes them to glow with phosphores-

cence, and it furnishes food to many surface-feeding pelagic animals. Consult California University, Scripps Institute for Biological Research, *Hydrographic Plankton and Dredging Records, 1901-1912* (Berkeley, 1915). See PALEONTOLOGY.

PLANORBIS (Neo-Lat., from Lat. *planus*, level + *orbis*, circle). A genus of pulmonate gastropods with discoidal shell of many whorls, remarkable for its racial longevity. It appears first in Lower Jurassic time, becomes very profuse in the Tertiary, and is still to-day in a flourishing condition.

PLANQUETTE, plän'kët', ROBERT (1850-1903). A French composer of light opera, born in Paris. He studied at the Paris Conservatory and wrote at first mediocre songs. His success came with his adoption of the *Musiquette*, a genre in which he wrote 16 very successful operettas between 1873 and 1892, one of those best known in America and England being *Les cloches de Corneville* (1877), also known as *The Chimes of Normandy*. Others scarcely less popular are *Nell Gwynne* (1884), *La crémaillère* (1885), and *The Old Guard* (1887), written for the English stage. A posthumous work, *Le paradis de Mahomet*, was brought out in Paris in 1906. His music is light and graceful and thoroughly representative of the school which claims as its exponents Lecocq, Audran, Serpette, Banès, Vasseur, and Victor Roger.

PLANT. See PHYSIOLOGY OF PLANTS; MORPHOLOGY.

PLANT, MORTON F. (1852-). An American financier and philanthropist. He was born at New Haven, Conn., where he was educated at Russell's Military School. In 1868, at Memphis, Tenn., he entered the employment of the Southern Express Company, of whose board of directors he eventually became president. By 1884 he was vice president of a group of railroads known as the Plant System. This office he continued to hold until 1902, when the group became part of the Atlantic Coast Line. Plant served as vice president and director of the Chicago, Indianapolis, and Louisville Railway and of the Peninsula and Occidental Steamship Company, and as director of the New York, New Haven, and Hartford (until 1914) and of the Atlantic Coast Line. He became much interested in the project to establish the Connecticut College for Women at New London (opened 1915), contributing \$1,125,000 of its \$1,500,000 endowment and giving in addition two dormitories.

PLANTAGENET, plän-tāj'ê-nët. A royal house of England which succeeded to the throne in 1154 in the person of Henry, son of Geoffrey, Count of Anjou, and Matilda, daughter of Henry I (see HENRY II), and ruled in the direct male line till 1399. The name of Plantagenet is commonly said to have been applied to Geoffrey of Anjou from his habit of wearing sprigs of broom (*planta genesta*) in his cap. The house gave to England some of its ablest rulers, and the period of the later Plantagenets especially is important for the development of the Parliament and the determination of the general character of English constitutional growth. The monarchs of this line were: HENRY II (1154-89); RICHARD I (1189-99); JOHN (1199-1216); HENRY III (1216-72); EDWARD I (1272-1307); EDWARD II (1307-27); EDWARD III (1327-77); RICHARD II (1377-99). With the death of the childless Richard II in 1399 the crown passed to the house of Lancaster (q.v.), descended from John of

Gaunt, fourth son of Edward III, and therefore in reality a branch of the house of Plantagenet. The Lancastrian monarchs were forced to contend against the claims of the house of York (q.v.), similarly descended from a son of Edward III. (See also ROSES, WARS OF THE.) The line of York attained the throne in the person of Edward IV (1461-83), but with the death of his brother, Richard III (1483-85), the crown passed to the house of Tudor (q.v.). Consult Hubert Hall, *Court Life under the Plantagenets* (New York, 1902), and T. F. Tout, *History of England, 1216-1377* (ib., 1905).

PLANTAGENET, JOHN. See BEDFORD, JOHN PLANTAGENET, DUKE OF.

PLANTAIN (OF., Fr. *plantain*, from Lat. *plantago*, plantain; connected with *planta*, plant), COOKING BANANA, ADAM'S FIG (*Musa paradisica*). An herb of the family Musaceæ, widely cultivated in the tropics for its fruits, which resemble those of the banana, but are less sweet and less pleasant to eat uncooked. It is one of the most important of tropical fruits, since a very large part of the human race use it as a principal food. In habit of growth it resembles the banana (q.v.). The name "plantain" is also given to the genus *Plantago* of the family Plantaginaceæ. There are 100 or more species of wide distribution, practically all of which are weeds, though in dry climates some are valuable as forage plants. *Cacalia reniformis*, a plant belonging to the Compositæ, is called Indian plantain. The species of *Alisma* are called water plantain. Consult E. L. Morris, "North American Plantaginaceæ," in Torrey Botanical Club, *Bulletin*, vols. xxvii, xxviii, xxxvi (New York, 1900-09).

PLANTAIN EATER. Either of two West African birds of the turaco family, Musophagidæ, which have serrated bills and feed on fruits, especially that of the banana tree. Both are birds of the size of a crow, are handsomely colored, and form the genus *Musophaga*. The name is sometimes extended to various other genera. See TURACO.

PLANT BREEDING. The art of improving plants by crossing and selection. In general plants tend to reproduce their main characters unchanged, but their long-recognized tendency to vary has prompted much experimentation, which, with the undirected variation, has resulted in the production of many cultivated varieties, strains, and races. In some cases the variation appears on a part of a single individual and can be traced to no apparent cause. Such variations are usually called sports, and, when desired, are propagated by artificial asexual methods, which consist of the indefinite propagation of a single individual by cuttings, grafts, layers, etc. This method is one of the simplest and in some respects the surest method of plant breeding, since as a rule sports are less plastic than other variant forms. The principal objection raised against the method is the weakness supposed to follow long-continued asexual propagation. Familiar examples of this type of breeding are the weeping willows and elms, cut-leaved birches and maples, variegated foliage plants, etc. Selection, a second method, consists in the saving of seed from only such individuals as exhibit qualities not possessed by all, undesirable forms being destroyed. Plants grown from seed tend to vary greatly because of the action of diverse factors. As with many varieties of grapes, apples, and other fruits, some seedling may exhibit sufficient

merit to be propagated without further selection by the asexual methods mentioned. Usually, however, the progeny shows only a slight improvement over the parent plant, and selection must be continued until the ideal is approximated or an improvement secured that is worth commercial introduction.

Associated with selection, and in many cases preliminary to it, is fertilization, which may result from the transportation of pollen by wind or insects in a natural cross, as in numerous hybrids of oak, willow, etc., occurring in nature. Or there may be an artificial transfer of pollen for a definite purpose. Variations are often introduced by this means and the desirable variant propagated and improved by long-continued selection. Since Darwin's time the superabundant nutrition of plants has been held to be a prominent cause of variation. A large part of the work of improving sugar beets, potatoes, tomatoes, cereals, etc., has been along these lines. The usual method of artificial pollination is to remove the immature stamens from the flower to be fertilized unless the pistil is known to be sterile to pollen of the same variety of plant. When the stigmas of the emasculated flower are ripe, pollen from a related plant is placed upon them and the flower covered with fine gauze or a paper bag to prevent an accidental application of other pollen. When the fruits or seeds are mature they are collected, and are planted when the usual season for planting arrives. From the progeny of such a fertilization individuals that differ from both parents are selected as the basis of new varieties. When a desirable form is found it is subjected to further cultivation and selection, attention being given to keep the selection always along one line, since any deviation will likely result in the ultimate failure of the experiment. In making selections the individual plant and not any particular portion of it must be the unit of selection. In following out this improvement thousands of individuals will probably have to be discarded. It is said that an American carnation grower destroyed more than 60,000 plants that he had reared to flowering to secure a single new desirable variety.

In plant breeding the following principles are laid down: thorough knowledge of the plant, a preconceived ideal established and maintained throughout, the employment of large numbers of seedlings in all selection experiments, and the selection of fixed characters as far as possible. A knowledge of the following correlations will aid the plant breeder: small foliage is usually associated with small fruit; dwarf seedlings produce poor plants; pale-colored foliage is usually an accompaniment of light-colored fruit, flowers, etc.; large individuals are incompatible with numerous specimens, great productiveness with extreme earliness, and very great size with intense coloration. By paying attention to these principles a skillful plant breeder can influence almost at will the external characters of form and color and the internal qualities of flavor, perfume, and, to some extent, chemical composition. It is quite as possible, however, for varieties to degenerate under selection as to improve, and this fact shows the importance of making the proper selection and constantly keeping it in mind in subsequent selections.

Bibliography. *Transactions of the International Conference on Plant Breeding* (New York, 1902), and a brief abstract of them in *Experiment Station Record*, xiv (Washington, 1903).

A third conference was held in London in 1906 and the fourth in Paris in 1912. For further information, see *New Jersey Experiment Station Report for 1901* (Trenton, 1902), in which the plant-breeding work of the American Experiment Stations is summarized; United States Department of Agriculture *Year Books* (Washington, 1897-99); Hugo De Vries, *Die Mutations Theorie* (Leipzig, 1901; Eng. trans., 2 vols., Chicago, 1900-11); H. M. Vernon, *Variation in Animals and Plants* (New York, 1903); Carl Friewirth, *Die Züchtung der landwirthschaftlichen Kulturpflanzen* (5 vols., Berlin, 1904-12); W. S. Harwood, *New Creations in Plant Life* (2d ed., New York, 1907); Hugo De Vries, *Plant Breeding* (Chicago, 1907); A. D. Darbishire, *Breeding and the Mendelian Discovery* (London, 1911); J. M. Coulter, *Fundamentals of Plant-Breeding* (New York, 1914); Luther Burbank, *Luther Burbank: His Methods and Discoveries, and their Practical Application* (12 vols., ib., 1914-15); L. H. Bailey, *Plant Breeding*, new edition, revised by A. W. Gilbert (ib., 1915). The following periodicals are largely devoted to plant breeding: *Journal of Heredity* (Washington); *Journal of Genetics* (Cambridge); *Zeitschrift für Pflanzenzüchtung* (Berlin); *Zeitschrift für induktive Abstammungs- und Vererbungslehre* (ib.). See BREEDING, *Plant Breeding*.

PLANT BUG. Any one of several families of true bugs, which feed upon plants by extracting the sap through the beaks. The Coreidae are a very large and important family, containing more than 1500 species. The squash bug (see SQUASH INSECTS) is a representative of this group, as also is the box-elder plant bug (*Leptocoris trivittata*), a species which frequently damages the box-elder trees that, because of their rapid growth, are commonly planted on Western tree claims. The Pyrrhocoridae are a much smaller group, but include several well-known species. The red bug or cotton stainer, which does considerable damage to cotton in Florida, as well as to the orange groves, is a prominent example. The family Lygaeidae is another of the largest families of plant bugs, comprising more than 1300 species distributed in 13 subfamilies and 208 genera. About 175 species are known in the United States. The most prominent member of this family is the chinch bug (q.v.). The bordered plant bug (*Stiretus anchorago*) is a brilliant species which preys on the larvæ of the Colorado potato beetle and is sometimes called the potato-bug enemy. Consult: V. L. Kellogg, *American Insects* (New York, 1908); J. H. Comstock, *Manual for the Study of Insects* (8th ed., Ithaca, 1909); L. O. Howard, *The Insect Book* (new ed., New York, 1914). See COTTON INSECTS; and Colored Plate of INSECTS.

PLANT CUTTER. One of the tanager-like birds, related to the cotingas (see COTINGA) and the American flycatchers. They constitute a small family (Phytotomidae), and show some remarkable anatomical peculiarities. The bill is short, strong, conical, with lateral margins finely serrated. The intestine is short, an unusual condition in vegetable-eating birds. They live in pairs or in small flocks and commit depredations in orchards and gardens by cutting off plants, buds, and fruits. They also catch insects. There are three species, all natives of temperate South America, the best-known of which is the rara (*Phytotoma rara*) of Chile, of the size of the common thrush and of reddish brown and white plumage. It has a short low flight and a dis-

agreeable rough note. See Plate of COTINGAS, ETC.

PLANT GEOGRAPHY. See DISTRIBUTION OF PLANTS.

PLANTIGRADE ANIMALS (from Lat. *planta*, sole of the foot + *gradi*, to walk). Animals that have the foot so formed that the whole sole touches the ground in walking. Man and the bear are examples. The term is used in opposition to digitigrade, or walking on the tips of the toes, like the horse and the dog. Between plantigrade and digitigrade animals all sorts of gradations intervene.

PLANTIN, plän'tän', CHRISTOPHE (1514-89). An eminent French bookbinder, printer, and publisher, born at Mont-Louis, near Tours. In 1555 he set up at Antwerp a printing establishment which soon became one of the most celebrated of the time. The most noted of all his publications is the *Biblia Regia* (8 vols., 1568-73). (See POLYGLOT.) His books were noted for the accuracy of their text and the beauty of their typography and embellishments. In 1571 he became court printer of Philip II of Spain, and amassed a fortune, which he lost through his polyglot Bible. He left a catalogue of the books printed in his establishment. See PLANTIN-MORETUS, MUSÉE. Consult Debacker and Ruelens, *Annales Plantiniennes, 1555-89* (Paris, 1865), and the *Life* by Roose (Antwerp, 1892).

PLANTIN-MORETUS, plän'tän'-mò-rä'tus, MUSÉE. An important museum in Antwerp containing a rare collection illustrating the art of printing and named for Christophe Plantin (q.v.) and his son-in-law and successor, Moretus. Plantin's printing office after 1579 was carried on in the present building until 1875, when the house with its contents was purchased by the city. The museum includes interesting apparatus and specimens of ancient work, and the residence of Plantin, with antique tapestry, furniture, paintings, and porcelains.

PLANT LOUSE. See APHID; JUMPING PLANT LOUSE; WOOLLY APHIDS.

PLANT PATHOLOGY. The study of the diseases of plants. Theoretically any interference with the normal activities of the plant may be called a plant disease. In practice, however, plant pathology has thus far been restricted chiefly to the diseases of plants induced by parasitic fungi and, in fact, to diseased plants of economic importance. The great losses due to these diseases are indicated by the fact that the United States in connection with its Department of Agriculture has an extensive organization for the study of plant diseases. Much of this study has been directed to investigations of the life histories of the parasites in order to discover methods of disease control. In recent years increasing attention is being given to the abnormal physiology of the attacked plant, i.e., the reaction of the host plant to the presence of the disease-producing parasite itself. All diseases can be referred to three categories, each with its own symptoms, as follows: (1) parasites immediately destructive, in which case the protoplast (living cell) is destroyed at once; (2) parasites that enter into symbiotic relationships with the protoplasts of the host, resulting often in the abnormal growths called hypertrophies; (3) parasites which invade the water-conducting wood vessels, thus interfering with the water supply, and producing such diseases as the various wilts. The methods of control are

various, but the one best developed is the use of fungicides (see FUNGICIDE), which in many cases has proved effective. The most hopeful method, however, is the breeding of disease-resistant races, and the permitting of susceptible races to disappear. See FUNGI.

Bibliography. Duggar, *Fungous Diseases of Plants* (Boston, 1909); Stevens, *The Fungi Which Cause Plant Disease* (New York, 1913).

PLANT PHYSIOLOGY. The study of the functions of plant organs. See PHYSIOLOGY OF PLANTS.

PLANTS (AS. *plante*, from Lat. *planta*, plant). In law, specifically, such vegetable growths as are not included in the terms "emblemments," "crops," or "growing trees," except nursery trees. The term includes bushes, shrubs, and nursery trees. Where plants are set out by a landlord they become part of the real estate and cannot be removed by a tenant, although he may alter the position of them, or remove a reasonable number of them in the ordinary course of husbandry during his term. Where a tenant sets out plants they become attached to the real estate as an integral part thereof, and are not removable by him unless they are for the purpose of temporary growth and sale, as the trees and other plants in a nursery. For example, a tenant could not remove, at the termination of his lease, berry bushes which were intended to produce annual crops, although he had set them out at his own expense. See EMBLEMENTS; FIXTURES; LANDLORD AND TENANT.

PLANTS, ALPINE. See ALPINE PLANT.

PLANTS, ANATOMY OF. See MORPHOLOGY.

PLANTS, BEACH, LITTORAL, SHORE, OR STRAND. See BEACH PLANTS.

PLANTS, FOSSIL. See PALEOBOTANY.

PLANTS, MOVING. See MOVING PLANT.

PLANTS, POISONOUS. See POISONOUS PLANTS.

PLANT SOCIETY, or ASSOCIATION, or COMMUNITY. An assemblage of plants growing in a common habitat under similar life conditions. See DISTRIBUTION OF PLANTS; ECOLOGY.

PLANT SOCIOLOGY. The study of plant associations, or vegetation. Hitherto it has not been clearly separated from plant ecology, but ecology is primarily the study of the influence of environment on plants (or animals) and their organs, while associations can be studied and classified without reference to environment. One of the most interesting phenomena of plant sociology is succession, which is the gradual replacement of one type of vegetation by another, without any concurrent fundamental change in environment. Consult Brockmann-Jerosch and Rübel, *Die Einteilung der Pflanzengesellschaften nach ökologisch-physiognomischen Gesichtspunkten* (Leipzig, 1912). See DISTRIBUTION OF PLANTS; ECOLOGY, and bibliographies there given.

PLAQUEMINE, plāk'mēn'. A town and the parish seat of Iberville Parish, La., 85 miles west-northwest of New Orleans, on the Mississippi River and on the Texas and Pacific Railroad (Map: Louisiana, G 6). A government lock connects the Mississippi with the Bayou Plaquemine. The town has trade in cotton, rice, sugar, lumber, and fish, and manufactures lumber products. It contains St. Basil's Academy, St. John's School, a fine public school, a courthouse, and a city hall. The water works are owned by the municipality. Pop., 1900, 3590; 1910, 4955.

PLASENCIA, plā-sēn'thē-ā. An ancient but much decayed town of west Spain, in the Province of Cáceres (Map: Spain, C 2). Picturesquely situated on a rocky promontory on the bank of the Jerte, it is surrounded by the remains of a double line of walls with 68 towers. An aqueduct of 53 arches leads into the town, where there is an ornate Gothic cathedral. Plasencia was once a flourishing city. Pop., 1900, 7965; 1910, 9459.

PLASMA, plāz'mā (Lat., from Gk. πλάσμα, formation, molded figure, from πλάσσειν, *plassein*, to form). The fluid portion of the blood, rich in proteids. After the removal of the blood from the arteries and veins a part of these proteids separate by coagulation and form the blood clot, which is composed of fibrin, leaving a fluid poor in proteids and called the blood serum.

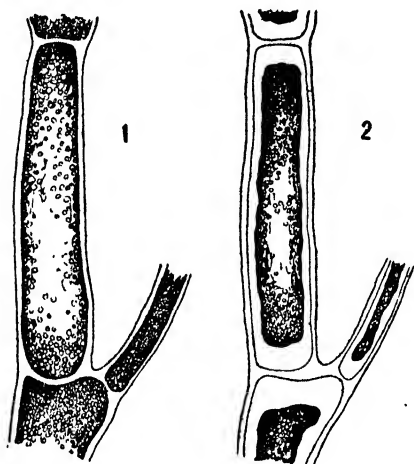
The term is also given by Haeckel to the protoplasm of cells surrounding the nucleus; or in the case of the monera, which are supposed to have no nucleus, to the unorganized protoplasm constituting such organisms. Cells are defined by Haeckel as bits of plasma containing a nucleus. See BLOOD.

PLASMA. A cryptocrystalline variety of quartz that is of a bright green to dark green color. Plasma is somewhat rare, and the best specimens come from India and China. Among the ancient Romans it was highly prized and was carved by them into ornaments of various kinds, and finely engraved specimens have been found among the ruins of ancient Rome. The variety used by the ancients is believed to have come from Mount Olympus in Asia Minor. See CHALCEDONY; GEMS.

PLASMODIUM (Neo-Lat., from Gk. πλάσμα, *plasma*, formation, molded figure + εἶδος, *eidos*, form). The vegetative body of a slime mold, consisting of a mass of naked protoplasm sometimes covering several square inches and crawling about like a gigantic amoeba. The significant feature of a plasmodium is its method of formation. When the spores of the plant germinate, they usually produce naked ciliated cells, which swim about freely, but finally coalesce in variable numbers to form a general body, the plasmodium, which is therefore a cell complex of naked cells. The plasmodium is one of the most favorable subjects for studying the behavior of protoplasm. See MYXOMYCETES.

PLASMOLYSIS (Neo-Lat., from Gk. πλάσμα, *plasma*, formation, molded figure + λύσις, *lysis*, resolution, from λύειν, *lyein*, to loose). The shrinkage of the protoplasm, due to the extraction of water from the cell sap by a solution of higher osmotic pressure in contact with the cell. The mature plant cell consists of a mass of protoplasm, inclosing one or more droplets of cell sap (vacuoles) and surrounded by a membrane called the cell wall. Under certain conditions, which are also those of activity, the layer of protoplasm is held so firmly against the cell wall by the osmotic pressure of the substances dissolved in the water occupying the vacuoles that it is usually stretched until its resilience equals the osmotic pressure within (Fig. 1). If such a cell be surrounded by a solution having an osmotic pressure greater than that of the cell sap, water will be withdrawn from the latter, the protoplasm will shrink, and the cell wall by its elasticity will follow the shrinking protoplasm until it has reached its unstretched dimensions. If the withdrawal of water still continues, the protoplasm will continue to shrink,

but the cell wall may be strong enough to maintain its form. Thus the protoplasm will be withdrawn from contact with the wall, a condition ordinarily taken to indicate the beginning of plasmolysis, but in reality a later stage (Fig. 2). If the cell wall be very thin, it may collapse upon



PLASMOLYSIS.

A cell from a filament of alga (*Cladophora*) before (1) and after (2) plasmolysis with sugar solution.

the shrinking protoplasm, folding and wrinkling irregularly. Should withdrawal of water continue, the protoplasm may shrink up into a small mass, the vacuole disappearing completely. When the amount of protoplasm in the plasmolyzed cell is relatively small, the protoplasm may happen to divide into two or more parts, a possibility which is taken advantage of for experimentation upon the functions of the nucleus. Only hypertonic solutions produce true plasmolysis of plant cells. It has been found, however, that distilled water produces what appears to be plasmolysis in some sea plants, and that hypertonic solutions of sodium chloride and other salts act similarly upon certain fresh-water forms. This has been termed false plasmolysis. It is probably due to the toxicity of these reagents in the pure form, rendering the protoplasm absolutely permeable to solutes within the protoplasm and vacuole. See OSMOSIS; Turgor.

PLASSEY, pläs'sé, or **PLASSI**. A small town of British India, on the Bhagirathi River, 75 miles north of Calcutta (Map: India, F 4). It is celebrated for the great victory gained by Clive (q.v.) over the numerically superior forces of Siraj-ud-Daula, Nawab of Bengal, June 23, 1757, a victory which laid the foundation of British supremacy in India. The actual site of the battle has been washed away by the river.

PLASTER (AS. *plaster*, OHG. *pflastar*, Ger. *Pflaster*, from OF. *plastre*, *plaietre*, *em-plastre*, Fr. *plâtre*, *emplâtre*, from Lat. *emplastrum*, from Gk. *ἐμπλάστρον*, *emplastron*, *ἐμπλάστον*, *emplaston*, plaster, from *ἐμπλάσσειν*, *emplassein*, to plaster, from *ἐν*, *en*, in + *πλάσσειν*, *plassein*, to form). A tenacious preparation for external application, solid at ordinary temperatures, but pliable and adhesive at the temperature of the body. Most plasters have as their base a compound of olive oil and litharge, constituting the lead plaster of the *Pharmacopœia*; others owe their consistence and adhesiveness to resinous substances or to a mixture of these with

wax and fats. These substances, alone or impregnated with medicinally active materials, are spread in a thin layer upon linen, muslin, paper, or leather. Formerly this spreading was done by hand, but of late years the work is accomplished entirely by machinery, which distributes the plaster mass with great evenness and perforates or makes porous the finished product. Since the introduction of machinery India rubber has been largely employed in the adhesive composition. There are seven plasters recognized by the *United States Pharmacopœia*, lead, mercury, opium, soap, resin (adhesive), capsicum, belladonna; the new *Formulary* includes three more, viz., aromatic or spice, camphor, and pitch; and there are many unofficial varieties. Besides their generally protective properties plasters have special therapeutic actions dependent on the active ingredient. Opium plaster, e.g., is anodyne, as is also belladonna; lead and arnica are soothing and astringent; mercury, alterative; capsicum is used as a counterirritant, and cantharides as a blistering agent. *Court plaster* consists of a solution of isinglass thinly spread upon silk, previously coated with tincture of benzoin. It is employed as a dressing to protect slight cuts or abrasions and must be moistened before application. Goldbeaters' skin is similarly used. In surgery, adhesive plaster is used extensively for its mechanical effect to reinforce weak muscles, to keep dressings in place, to cover ulcers, to limit effusions, etc.

PLASTER, LATHING AND PLASTERING. In architecture and building, plaster is a composition having lime for its basis, which is spread while wet and plastic upon a wall or ceiling, either directly or by means of laths (q.v.), brought to a true and smooth surface, and allowed to set or harden to form the final finished surface. The composition of plaster varies somewhat with the particular use. It is commonly applied in two or three coats. The first, or scratch, coat is a coarse mortar of lime and sand with hair or other fibre in abundance. If applied directly to brickwork or masonry, the joints must be raked out to provide a key for the secure adhesion of the plaster; if to laths or metal lathing, it must be forced by the trowel through the open spaces of the lathing. Its surface is then deeply scratched with the trowel to provide a key for the next coat, which in three-coat work is called the brown coat or floated coat of lime and sand without hair. This coat should not be applied until the scratch coat has set and dried; its surface is brought to a true plane (or other desired form) even with the grounds, which are strips of wood of the requisite thickness nailed to the lathing at intervals to serve as guides and to provide edges against which the plaster is to stop. At salient corners the plaster is finished against corner beads or rules of wood or metal. The third coat may be of lime with fine sand (sand finish) or of lime, very fine sand, and plaster of Paris (q.v.), called hard finish; or of any special composition, of which many kinds are patented, some of which are waterproof, others of differing degrees of elasticity to allow for racking and settling. The finish coat may be left bare or be kalsomined, papered, painted, or otherwise decorated.

This is a mere outline of the processes employed; the details vary greatly in different countries and for different kinds of work. The lime must in all cases be thoroughly slaked before mixing. In Europe it is prepared weeks or

months in advance of building, stored in pits covered with straw or earth, and allowed to ripen; in the United States a week or even less time is allowed for this purpose. The proportion

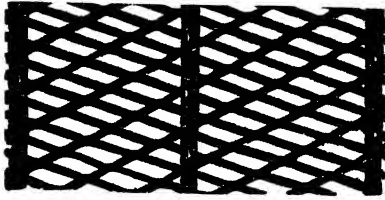


FIG. 1. EXPANDED METAL LATHING.

of sand mixed with it varies, but in general it is about double the volume of lime, the ingredients are mixed with sufficient water to produce the desired consistency. The laths, if of wood, are nailed about $\frac{1}{4}$ of an inch apart. Metal lathing may be of wire mesh, expanded metal (Fig. 1), or perforated metal (Fig 2). Being fireproof and capable of being bent to fit curved surfaces, it is displacing wood laths for all high-

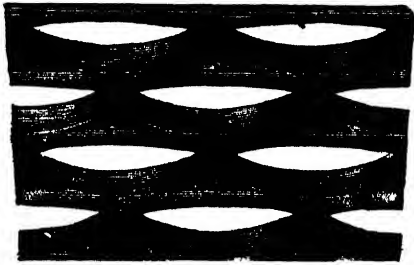


FIG. 2. PERFORATED METAL LATHING.

class work. In ancient work the laths were of thin boards split into strips when nailed, or even, in England, of wattle (wattle and dab work). Decorative details, such as moldings, cornices, rosettes, and other ornaments, may either be run or molded in the wet plaster, or separately cast in plaster of Paris and nailed or cemented in place. Stucco (q.v.) is a special plaster having an admixture of cement, often with powdered marble in place of sand.

Plaster and stucco were known to the Assyrians, the Romans employed them lavishly for interior decoration, molding delicate patterns in relief in the wet plaster or painting them with pictures and ornaments in fresco, tempera, or encaustic pigments. The Renaissance revived the use of plaster and greatly extended its decorative applications, both by fresco (q.v.) painting and by relief ornaments and sculpture, which became at last media for the most extravagant abuse. In the seventeenth century the English began to use plaster extensively, too often as a substitute for solid masonry construction, leading to much trivial and sham architecture; and this practice became universal in the United States with the general adoption of wood as a building material. But much delicate and beautiful decorative work was done both in America and in Europe during the eighteenth and the early nineteenth century, especially in ceiling decoration. Consult: E. C. Eckel, *Cements, Limes, and Plasters* (New York, 1905), H. G. Richey, *Building Mechanics' Ready Reference Cement Workers' and Plasterers' Edition* (ib., 1908), F. T. Hodgson (comp.), *Mortars, Plasters, Stuccos, Artifi-*

cial Marbles, Concretes, Portland Cements, and Compositions (Chicago, 1914). See BUILDING; GYPSUM; LATHS AND LATHWOOD

PLASTER OF PARIS. A cement obtained by pulverization and partial calcination or dehydration of gypsum. It is chemically a hydrated sulphate of lime ($\text{CaSO}_4 + 2\text{H}_2\text{O}$), containing 46.6 per cent of sulphuric acid, 32.5 per cent of lime, and 20.9 per cent of water. Heated to a temperature between 250° and 400° F., gypsum loses three-fourths of its water and, in powdered form, is then known as plaster of Paris. Keene's cement is similar to plaster of Paris, the chief difference being that it is calcined at a much higher temperature (about 500° F.), all of its water is expelled, and it is an anhydrous sulphate. Both plaster of Paris and Keene's cement harden or set when water is added, and to this property they owe their value in commerce and the arts. Setting is caused by the plaster and water uniting to form gypsum again, which assumes a crystalline condition. It takes from 6 to 10 minutes for plaster of Paris to set, while Keene's cement, being wholly anhydrous, is of slower action and requires from 2 to 6 hours. To delay the set of plaster of Paris, glue, soda, sorghum, or some similarly acting substance is added as a retarder, and the mixture, taking several hours to set, is known as cement wall plaster, and is used, either by itself or in combination with lime paste, for the white or skim coat of walls and ceilings. Setting is attended by expansion of mass, and to this fact is due the sharpness of casts.

In commerce, besides being used for hard-finish plaster for walls and ceilings, plaster of Paris enters into the manufacture of staff, employed in the construction of temporary buildings; the construction of slabs, for permanent interior partitions, and the making of floor fillings. In surgery plaster of Paris is invaluable for making casts to inclose fractures; in dentistry it is employed for impressions from which plates are made and teeth set.

In the arts plaster of Paris is used for making casts of sculpture in the round, of high and low reliefs; of architectural details and replicas of archaeological objects, also for taking life and death masks of the human face. In pre-Renaissance interior sculpture a thin coat of plaster of Paris was often spread over wood or stone and impressed before setting with a fine diaper pattern as a foundation for paint and gilt embellishment. Plaster of Paris figured in the composition of the stucco or stucco duro of the Renaissance that was used for the molded enrichment of walls and ceilings and was introduced into England by Italian artisans during the reign of Henry VIII, but it did not enter into the composition of the parge, in which much of the best seventeenth-century English plasterwork was wrought. Since the beginning of the eighteenth century plaster of Paris has been extensively used, either by itself or as stucco in combination with lime paste, for cornices and ceiling enrichments. Consult William Millar, *Plastering, Plain and Decorative* (London, 1905), and G. P. Bankart, *The Art of the Plasterer* (New York, 1909). See GYPSUM; MORTAR.

PLAS'TIDS (from Gk. πλαστός, *plastós*, molded, from πλασσειν, *plassein*, to form), or CHROMATOPHORES. Living organs of the cell, usually embedded in the cytoplasm, of various form, having functions differing according to their ultimate mode of development. They differ from the nucleus in form and composition and

in multiplying by direct division. They are of three kinds—chloroplasts, chromoplasts, and leucoplasts. Chloroplasts (q.v.) contain chlorophyll and carotin, with often other subordinate pigments which add their special tint to the general yellow green of the ordinary chloroplast; chromoplasts (q.v.) have usually a red or yellow color, due to a predominance of carotin; leucoplasts (q.v.) are colorless and have as their special functions the formation of starch grains, proteid granules, or oil drops, out of material absorbed from the adjacent protoplasm. The oil formers have been distinguished as elaioplasts. Multiplication of plastids by direct division consists in the severance of the protoplasmic matrix into two parts by its contraction, which continues near the middle until the two portions are completely disjoined. Plastids are minute and undifferentiated in embryos and take on special form and character under the influence of the external conditions. Thus, plastids which develop near the surface of the plant are likely to form chlorophyll and become chloroplasts; those which develop in subterranean organs or thick aerial parts are likely to become leucoplasts and act as starch or proteid formers; while the plastids in flower leaves, the fruit, or even those in the root (e.g., the carrot) may develop as chromoplasts. See CELL; MITOSIS.

PLATA, pla'ta, Río DE LA. The estuary of the combined Paraná and Uruguay rivers (qq v.) in South America. It forms a large marine inlet between the republics of Uruguay and Argentina (Map: Argentina, H 4). It is 143 miles wide at its mouth and tapers gradually inland for a distance of 200 miles to the delta of the Paraná. The Plata is the outlet for an enormous volume of water, amounting during floods to over 2,000,000 cubic feet per second. Vast quantities of sediment are also brought down by the two rivers and are gradually filling up the estuary, which formerly extended more than 100 miles farther inland. Shoals are everywhere forming rapidly and, together with the strong currents and violent storms, make navigation dangerous. The best natural harbor on the estuary is Montevideo; artificial harbors have been constructed at La Plata and Buenos Aires by means of jetties projecting beyond the shallows which line the Argentine shore. The Plata estuary was discovered in 1509 by Díaz de Solís and received its present name (silver river) from Sebastian Cabot.

PLATEA, or **PLATEÆ** (Lat. from Gk. Πλάταια, *Plataia*, Πλαταιά, *Plataiai*). An ancient city in the extreme southeastern part of Bœotia, on the borders of Attica, at the foot of Mount Cithæron (Map: Greece, Ancient, C 2). Involved in war with Thebes, it sought help of the Spartans and was referred to Athens, as a nearer ally, apparently about 500 B.C. Received and defended by the Athenians, the Plateans showed their gratitude by coming with their whole force to the help of the Athenians at Marathon (q.v.). For this they suffered severely in 480 B.C., when Xerxes destroyed the town. The great victory of the Greeks under Pausanias over the Persians under Mardonius, gained near the town in the following year, restored them under a national agreement that guaranteed their independence. Their devotion to Athens brought on them the hatred of the Thebans, who made an unsuccessful attempt to take the town by surprise in 431, at the opening of the Peloponnesian War, and, when Platea was finally forced to surrender to

the Spartans (427 B.C.) after two years' siege, secured the death of the defenders. Restored after the Peace of Antalcidas (q.v., 387 B.C.), it was once more destroyed by the Thebans in 373. Finally, under Alexander the Great it was again rebuilt, but sank into insignificance, though it was still of some importance in the time of Justinian, who rebuilt its walls. The present walls seem to belong to the later city and inclose a much greater circuit than can have belonged to the town of the fifth century B.C.

Bibliography. G. B. Grundy, *The Battle of Plataea* (London, 1894); id., *The Great Persian War* (ib., 1901); H. B. Wright, *The Campaign of Plataea* (New Haven, 1904); W. Woodhouse, in *Journal of Hellenic Studies* (London, 1908); R. W. Macan, appendix to edition of *Herodotus*, vii-ix (ib., 1908); Winter, *Die Schlacht bei Plataeae* (Berlin, 1909).

PLATE. The word "plate" is properly used to designate ecclesiastical vessels, tableware, and sundry other objects made of gold or silver, with the exception of coins, jewelry, and articles intended to be worn upon the person. By an extension of the term's application pewter also is sometimes included under the head of plate. Articles of gold or silver coated upon a baser metal are known as plated ware, not plate, the latter term being reserved to indicate the use of the solid metal without a structural foundation of cheaper metal.

Gold in its chemically pure state is too soft to withstand the stress of usage and must be hardened with an alloy. For this purpose either silver or copper is used. The former imparts a pale or greenish tinge, the latter a reddish hue. The goldsmith may make his alloy and control his color to suit his purpose, but it is generally considered that the most satisfactory mixture for ordinary uses is composed of 6 parts of alloy to 18 parts of fine gold. For a piece not subjected to constant wear a mixture of 2 parts of alloy to 22 parts of fine gold is considered more satisfactory. See CARAT.

Gold may be cast, stamped with a die, beaten or hammered, chased or engraved, saw-pierced, and spun. Goldsmith's work also includes repoussé work, soldering of part to part and the attaching of small balls or grains of gold to their groundwork, a practice common in antiquity. (See JEWELRY) The goldsmith must also be expert in the setting of jewels, as, quite apart from the making of jewelry, precious stones are often used to embellish fine pieces of gold plate, especially plate for ecclesiastical use. Gold was one of the first metals used by man and has always occupied a conspicuous place in the arts. From remote antiquity to our own day every age has supplied notably fine examples of gold plate. The gold work of the Byzantine smiths was justly famed and supplied some of the inspiration that was later elaborated in the Gothic work of the mediæval goldsmiths. During the Roman period gold plate was chiefly for table use; during the Middle Ages and later it was confined chiefly to ecclesiastical purposes and the finest pieces are to be found among the chalices, pyxes, patens, monstrances, ciboria, censers, and reliquaries, sometimes set with gems, sometimes without other enrichment than the cunning craftsmanship of the smith. The use of gold plate for table service is a modern return to ancient luxurious precedent. Of mediæval specimens of goldsmith's art the *pala d'oro* or golden screen

in St. Mark's, Venice (ninth to eleventh century), and the golden altar of Sant' Ambrogio, Milan (ninth century), are perhaps the most deservedly famous.

In contour and type of decorative design gold plate accords with the age of its production. The most grace of shape is found in the early Greek, the Etruscan, and some of the Roman work; the most intricacy of decorative design and the most ingenious deftness of the craftsman in the mediæval work to be found from Constantinople to Ireland. In contour and decorative design modern gold plate rarely equals the old, as glitter and ostentation are too often set above the true worth of the goldsmith's skill.

Silver has for so many years been used for table service that "plate" and "tableware" are virtually synonymous. Like gold, silver in its fine or pure state is too soft for ordinary wear and must be alloyed to make it sufficiently hard. Copper is generally used for this purpose. Standard or sterling silver in England (also the generally accepted standard for America) is silver with the percentage of alloy so restricted that the metal shall be of the quality required by law for receiving the hall-mark. Eleven ounces, two pennyweights of fine or pure silver to the pound Troy was the old requirement for sterling silver, while the usual modern standard is an ounce of 18 pennyweights of fine silver and 2 pennyweights of copper. Silver plate is now usually spun or stamped and soldered and is rarely fashioned by the old process of raising or beating up a cup shape out of flat metal. Repoussé work, engraving, and chasing are the usual decorative processes employed.

Specimens of silver plate admirable in contour and decoration testify to the skill and taste of ancient silversmiths, as do the early pieces of gold plate. During the Middle Ages silver plate served the same liturgical uses as gold and was fashioned in the same manner, but, in addition, played a part in the domestic equipment of the houses of the wealthy in the form of platters, tankards, and covered cups. From the fifteenth century onward family silver in England and on the Continent became comparatively plentiful and was marked with the arms of the owners and enriched with divers decorative devices as well. So late as the eighteenth century it was a common thing, especially in America, to have surplus funds converted into table silver, which, in time of need, could be readily turned back into coin.

Silver forks and silver-handled knives were not in general use until much later than other articles of tableware. The earlier pieces of table service consisted chiefly of salts, porringers, spoons, platters, mugs, cans, tankards, teapots, sugar bowls, and creamers. All of these were made in great numbers by continental, English, and American silversmiths. The design of English table silver was closely followed by American makers in the Colonies, and the handiwork of the smiths from New England to the South was in no way inferior to that of their English contemporaries. Dummer, Hull, Revere, and many others will always be remembered as masters in their craft. A peculiarity of American silver is that much of it is unmarked by the maker. Then, again, in many cases the makers changed their mark from time to time and the date letter, found in

English silver, is lacking. This was doubtless because there was no central organization, as in England, which controlled the silversmiths and regulated their actions. From the middle of the seventeenth century onward the American silversmiths displayed great ability in their craft. The best American silver was made in Boston, Newburyport, New York, Albany, Philadelphia, Baltimore, and Richmond.

Sheffield plating consisted in soldering on to one or both sides of an ingot of the baser metal, usually copper, a thin plate of silver. After cooling from the soldering process the metal is rolled into sheets of the required thickness and then worked into the desired shapes. This difficult and nice process was supplanted in ordinary commercial usage by the introduction of electroplating. Since the middle of the nineteenth century electroplated table silver has been extensively manufactured in the United States. The body material upon which the silver is plated is frequently a composite metal known as German silver, consisting of 53 per copper, 31¼ per cent zinc, and 15¼ per cent nickel. Articles are finished in their required shapes before the electric bath is applied. The terms "single," "triple," and "quadruple" plate have reference to the amount of time the object is exposed to the electric bath and the consequent thickness of the silver deposit. In applying the electroplating process the objects to be coated are first cleansed in caustic soda and then in a strong solution of acids. See ELECTROPLATING. Consult: J. H. Buck, *Old Plate* (New York, 1888); Nelson Dawson, *Goldsmiths' and Silversmiths' Work* (New York, 1907); W. J. Cripps, *Old English Plate* (London, 1914).

PLATE, plâ'te, LUDWIG (1862-). A German zoölogist, born in Bremen. He studied at the universities of Jena, Bonn, and Munich. Zoölogical expeditions were made by him to the west coast of South America (1893-95), to Greece and the Red Sea (1901-02), and to the West Indies (1904-05). For a time curator in the Institut für Meereskunde at the University of Berlin, in 1909 he became professor of zoölogy at Jena. He published important research papers on Mollusca (*Chiton*) and a comprehensive summary and discussion of evolutionary problems in *Selectionsprincip und Problem der Artbildung* (4th ed., 1913).

PLATEAU, plâ-tô' (Fr., dim. of *plat*, plate). An elevated area of fairly level land with approximately horizontal strata. The chief difference between a plain and a plateau is that the plateau is higher; but this very difference in altitude gives the streams a chance to cut deeper valleys than in a plain. Plateaus are almost uniformly associated with mountains, being great blocks of strata uplifted during mountain folding with little disturbance of the layers. Thus, the uplift that formed the Western Cordilleras raised the plateau known as the Great Plains, which rises gently from the Mississippi to an elevation of 4000-6000 feet at the base of the Rockies; the Colorado plateau, between the Rockies and the Sierra Nevada, 6000-9000 feet high; and the Columbia plateau of Oregon and Washington. West of the Appalachians, and uplifted with them, is the Alleghany plateau, 2000 feet or more in height, which extends from eastern New York to Tennessee and includes hilly central New York, western Pennsylvania, West Virginia, eastern Kentucky, and Tennessee. The uplift of the Himalayas has formed the lofty plateau of

Central Asia, which rises from 10,000 to 13,000 feet. Plateaus are frequently so sculptured by denudation as to resemble mountains in form as well as in height, as in the case of the Catskills, a part of the Alleghany plateau. Their tops, however, form an even sky line, their strata are nearly horizontal, and it is only the excessive denudation, carving deep valleys, that has given them the mountainous appearance. For such dissected plateaus the name "pseudo-mountains" has been proposed. Where sculptured plateaus are adjacent to mountains it is often difficult to tell where the plateau leaves off and the true mountain begins.

Because of their elevation plateau streams have great cutting power and often form deep gorges and, in arid regions, cañons, of which the best example is the Grand Cañon of the Colorado. In arid regions the plateau topography is typically angular. The walls of the cañons consist of alternate precipices and talus slopes, as resistant and weak rock layers are encountered, and between the streams are flat-topped areas, capped by resistant strata, and known in western America as mesas if large and as table mountains or buttes if small. It is this flat-topped condition of the plateau, faced by steep slopes, that has given rise to the name "tableland" as a synonym for many plateaus in arid lands. Plateaus, in most climates, where the work of weathering and erosion is greater, are far less rugged and angular.

By reason of their height plateaus are generally cool, and, because of their association with mountains, they are often arid, having rain-bearing winds cut off by the higher land near by. Plateaus are not infrequently deserts, for other reasons. The high plateau region of Africa and Arabia, e.g., is traversed by the drying trade winds the year round and has little or no vegetation. Often the only parts of a desert plateau capable of supporting human life are the alluvial fans, on which streams flow from the adjacent mountains for a short distance before losing themselves in the sand. Portions of many plateaus, e.g., that of the Columbia, would be capable of cultivation if the water could be led out of the cañon valleys. In temperature there is often great range, from the warm base to the cool or cold top. This is well illustrated in the plateau of Mexico, which rises from a tropical climate to that of the cool temperate zone. Difference in temperature is accompanied by a decrease in evaporation and an increase in precipitation, so that the tops of high plateaus are often forest-covered, as in the case of the Colorado plateau, which rises from the desert region of western Arizona.

Agriculture is not usually highly developed on plateaus, partly because of the climate, partly because of the ruggedness. Grazing is the most widespread industry on arid plateaus, as in the western United States, where large areas are occupied only by scattered ranchmen. Consult W. M. Davis, *Physical Geography* (Boston, 1898), and R. D. Salisbury, *Physiography* (New York, 1909).


PLATEAU, JOSEPH ANTOINE FERDINAND (1801-83). A Belgian physicist, born in Brussels and educated at Liège. From the foundation of the University of Ghent in 1835 to 1871 he was there professor of experimental physics and astronomy. His researches were largely in optics, he devised the anorthoscope and was partly responsible for the stroboscope (q v).


Much of his work was done after he had become totally blind (about 1840), the eventual result of his having once gazed at the midday sun for 20 seconds to note the effects. His experiments are described in *Statique des liquides soumis aux forces moléculaires* (1873). Plateau also prepared a bibliography of the subjective phenomena of vision to the end of the eighteenth century.




PLATEAUX DES CAUSSES. See CAUSSES PLATEAUX DES.

PLATED WARE. See TABLEWARE.

PLATE MARKS, or HALL MARKS. The legal impressions made in Great Britain on watchcases, jewelry, and gold and silver plate, after the material has been assayed at the various government assay offices. In the case of jewelry the marks are, with a few exceptions optional. There are four distinct kinds of plate marks: (1) the standard or quality mark, (2) the mark of a particular office at which the article was assayed, (3) the mark by which the date of marking may be ascertained, and (4) the maker's private mark. Formerly if the article was dutiable the head of the reigning sovereign was also added, but in 1798 watchcases were exempted from this rule and in 1890 the practice was entirely abandoned. The standard

mark of the London office is a lion passant  for sterling silver, a crown with the figures 22

 for 22-carat gold, and the crown with the figures 18 for 18-carat gold. Up to 1845 a lion passant was likewise the standard mark of 22-carat gold, and from 1697 to 1723, during which time the quality of standard silver was raised from 0.925 to 0.959, the standard mark was a lion's head and the hall mark a figure of Britannia. The standard mark at Edinburgh is a

thistle ; at Glasgow, a lion rampant , at Dublin, a harp crowned , with the figure 22 added in the case of 22-carat gold.

The hall marks of some of the particular assay offices are: London, a leopard's head, crowned up to 1823 , Edinburgh, a castle , Glasgow, a tree, a fish, and a bell , Dublin, a figure of Hibernia ; Chester, a sword between three wheat sheaves ; Birmingham, an anchor  . In addition, the Sheffield

office is designated by a crown; Exeter, by a castle with three towers; York, by five lions on a cross; and Newcastle, by three castles.

The date marks of the Goldsmiths' Hall, London, which are changed annually on May 30, are the first 20 letters of the alphabet, each series differing in some slight detail (either in the style of the letter or in the shape of the shield on which they are placed) from a former series. The date marks of Birmingham, which are changed annually in July, are also letters of the alphabet.

The character of the maker's mark was optional up to 1697, when it was fixed as the first three letters of his surname. Since 1739 the mark has been the initials of the maker's Christian name and surname. Watchcases of foreign make when marked in Great Britain bear special stamps. In Switzerland there are various plate

marks, but the regulations concerning them are not comprehensive, and English marks are accepted in place of the Swiss. In the United States various arbitrary trade-marks are adopted by the leading manufacturers, but they have no official significance, although in certain States marking articles of gold and silver falsely as to their proportion of fine gold or silver is a legal offense. For gold and silver assayed in a United States assay office a certificate will be supplied.

Bibliography. G. E. Gee, *Hall-Marking of Jewellery Practically Considered* (London, 1882); W. J. Cripps, *English Plate Marks* (ib., 1882); id., *Old French Plate: Its Makers and Marks* (ib., 1893); F. J. Britten, *Watch and Clock-Makers' Handbook* (10th ed., New York, 1902); W. J. Cripps, *Old English Plate* (8th ed., ib., 1903); William Chaffers, *Hall Marks on Gold and Silver Plate* (9th ed., by C. A. Markham, London, 1905); Percy Macquoid, *Plate Collector's Guide* (New York, 1908), arranged from Cripps's *Old English Plate*; William Chaffers, *Marks and Monograms on European and Oriental Pottery and Porcelain* (13th ed., London, 1912), containing a bibliography; William Chaffers, *Handbook to Hall Marks on Gold and Silver Plate* (4th ed., New York, 1913); id., *New Collector's Hand-Book of Marks and Monograms in Pottery and Porcelain of the Renaissance and Modern Periods* (new ed., rev. by Frederick Litchfield, ib., 1914).

PLATEN-HALLERMUND, plät'en häll'ēr-munt, AUGUST, COUNT VON (1796-1835). A German poet, born at Ansbach. Educated in the Corps of Cadets and the Pages' Institute at Munich, he entered the Bavarian army in 1814 and took part in the campaign of 1815, seeing, however, no action. Wearing afterward by the monotony of garrison duty, he obtained a furlough and, provided with a stipend, devoted himself to philological and philosophical studies, first at Würzburg (1818-19), then until 1825 at Erlangen, where Schelling exercised a lasting influence upon him. He had early turned to Oriental studies and as a fruit thereof published in 1821 *Ghaselen*, a collection of poems in Oriental forms, followed in 1824 by *Neue Ghaselen*, both series winning favorable comment from Goethe. A visit to Italy in 1824 inspired *Sonette aus Venedig* (1825), the finest collection of sonnets in the German tongue, remarkable for classic beauty of form. Bitterly opposed to romanticism as he found it, he appears nevertheless under romantic influence (especially in choice of subject) in his dramatic poem *Der gläserne Pantoffel* (1824), welded out of the fairy tales of Cinderella and Snowdrop, in the comedy *Der Schatz des Rhampsinis* (1824), and in his later epic *Die Abbassiden* (1834), based on stories from the *Arabian Nights*. The extravagances of German romanticism, however, kindled his wrath, and he satirized the fate tragedy effectually in *Die verhängnisvolle Gabel* (1826), a fork here taking the place of the dagger by which, in the typical fate tragedy, the family ancestress comes to grief, and a dozen descendants being stabbed by the fatal fork before the close of the drama. The command of language and mastery of versification distinguishing this literary comedy are even excelled in *Der romantische Oedipus* (1829), directed more especially against the lack of form in romanticism and its tendency to experiment with new and unwieldy metres, the

chief targets of Platen's satire here being Immermann (q.v.), who had ridiculed his *Ghaselen*, parodied as "Nimmermann," and Heine. In 1826 Platen had made Italy his permanent home and thence only twice visited his native land. During his last sojourn in Germany in 1833 he published the historical drama *Die Liga von Cambrai* and *Geschichten des Königreichs Neapel von 1414 bis 1443*. He died at Syracuse, Sicily. Platen was a poet of exquisite taste, whose later verses are models of formal virtuosity in their complex rhythms and technical polish of rhyme.

Bibliography. His complete works were published in one volume (Stuttgart, 1839), in five volumes (ib., 1847), and often since. The best edition is that by Koch and Petzet (12 vols., Leipzig, 1910). His best biography is to be found in his *Tagebücher*, edited by Laubmann and Scheffler (Stuttgart, 1896-1900). Consult also: Minckwitz, *Graf Platen als Mensch und Dichter* (Leipzig, 1838); Gildersleeve, *Essays and Studies* (New York, 1890); Besson, *Platen: Etude biographique et littéraire* (Paris, 1894); Stockhausen, *Studien zu Platens Baleaden* (Berlin, 1899); Greulich, *Platens Litteraturkomödien* (Bern, 1901); Heinze, *Platens romantische Komödien* (Marburg, 1907); Schlösser, *A Graf von Platen* (Munich, 1910); Erich Petzet, *Platens Verhältnis zur Romantik* (Berlin, 1911).

PLATERESQUE, plät'er-ēsk' (Sp. *Plateresco*, from *platero*, silversmith, from *plata*, silver). A name given to that phase of Renaissance architecture and decoration which prevailed in Spain during the first half of the sixteenth century, passing gradually into the more dry and more formally classic development called the Griego-Romano. Its inspiration was Italian, in detail, especially after the battle of Pavia (1525); but the decorative spirit, the mixing of late Gothic details with those of the Renaissance, the contrasting of broad plain wall surfaces with crowded openings above and with rich concentrated decoration, and the exuberance of ornament, are distinctly Spanish. The doorways were treated with especial richness and were framed sometimes in a decorative composition reaching to the top of the building, as at Salamanca University; and the candelabrum shaft, derived from examples at Milan and Pavia, became a favorite ornament and even a substitute for columns, as in the court or patio of the Irish College in the same city. Escutcheons and armorial bearings were prominent in the decorative scheme. The carving was often exquisite in execution, recalling silversmiths' work by its richness and delicacy, whence the name of the style; but it was often overwrought, as in the Ayuntamiento at Seville. The predellas (q.v.), altarpieces, tombs, and ironwork (grilles and screens) are often marvels of decorative beauty of design and execution. Gil de Hontañon, Diego de Siloé, Egaz and Pedro Gumiel are among the prominent architects of this period. Consult A. N. Prentice, *Spanish Renaissance Architecture and Ornament* (Boston, 1908), and Byne and Stapley, *Rijeria of the Spanish Renaissance: A Collection of Photographs and Measured Drawings with Descriptive Text*, published by the Hispanic Society of America (New York, 1914).

PLATFORM SPRING, IN MOTOR VEHICLE. See MOTOR VEHICLE.

PLATHANDLER, plät'händ-lēr. A Dutch name in South Africa for the curious clawed toad (*Xinopus calcaratus*), which is distin-

guished by having strong metatarsal claws and minute eyes. These small frogs, which are tongueless, are peculiarly aquatic, never leaving the water except when forced to change their locality on account of drought or scarcity of food. Specimens have been naturalized in England, where their habits and methods of breeding have been well studied. Consult Hans Gadow, "Amphibia and Reptiles," in *Cambridge Natural History*, vol. viii (London, 1901).

PLATIERE, JEAN MARIE and MARIE ROLAND DE LA. See ROLAND DE LA PLATIERE.

PLATING. See ELECTROCHEMISTRY, INDUSTRIAL: ELECTROPLATING.

PLATINIRIDIUM (Neo-Lat., from *platinum* + *iridium*). A native alloy of iridium with platinum and allied metals that crystallizes in the isometric system, has a metallic lustre, and is silver white in color. It is found chiefly with platinum ores in the Urals and in Brazil; also in the gold alluvial deposits of the Pacific coast.

PLATINOTYPE. See PHOTOGRAPHY.

PLATINUM (Neo-Lat., from *platina*, from Sp. *platina*, platinum, from *plata*, silver, plate, from *plato*, flat, from Gk. *πλᾶνς*, *platys*, flat, wide, broad; connected with Lith. *platus*, broad, Skt. *prthu*, wide, from *prath*, to spread out). A metallic element, the existence of which was first made known in Europe by Antonio de Ulloa in 1738. It was first described by Watson in the *Philosophical Transactions* of 1750. It is found native, usually alloyed, however, with iron, palladium, rhodium, iridium, osmium, and other metals, generally in grains and scales in alluvial deposits in South America, the Urals, and, to a limited extent, in many other parts of the world; also in small quantities in the gold washings of the Pacific slope. A few irregular lumps or nuggets have been found, one of which, now in the Demidoff cabinet in St. Petersburg, weighs 7 837 kilograms. All of the early platinum came from South America and it was not until about 1825 that Russia began to figure as a producer. Some 90 per cent of the world's present annual supply comes from the Russian Urals. This has lately amounted to about 300,000 ounces per year. No other country produces more than 1000 ounces per year except the United States of Colombia, whose output fluctuates considerably, but may easily reach 12,000 ounces per year. For the preparation of pure platinum the commercial metal may be melted with six parts of pure lead and the finely divided alloy treated with dilute nitric acid. The residual black powder, containing lead, platinum, iridium and other platinum metals, may then be dissolved in dilute aqua regia, the lead, after evaporation of the solution to small bulk, precipitated with dilute sulphuric acid, and the filtrate further precipitated with an excess of ammonium chloride and some common salt. This precipitate of ammonium chloroplatinate with some rhodium is in turn heated with the acid sulphates of potassium and ammonium and, on cooling, the resulting mass is treated with hot water, which leaves nothing but pure platinum behind. The commercial metal is usually obtained by a somewhat complicated wet process, although it is possible to obtain it more or less pure by a dry process.

Platinum (symbol Pt; atomic weight, 195.2) is a grayish-white metal with a density in the cast form of 21.5 at 17.6° C. It fuses at about 1750° C. (3182° F.). It is very malleable and

ductile, becoming soft and workable at a temperature far below its melting point. It is somewhat harder than copper, and has a tenacity of 30,000 to 50,000 pounds per square inch. Wires have been drawn that are one twelve-hundredth of an inch in diameter. Small quantities of other associated metals commonly reduce its ductility. Molten platinum absorbs oxygen, which is violently evolved when the metal is rapidly cooled. Platinum foil may absorb from 80 to 200 times its own volume of hydrogen under different conditions. This and other gases are eliminated by heating the metal *in vacuo*. Spongy platinum is finely divided metallic platinum which possesses a very large surface compared with its mass and is able to absorb large quantities of oxygen. It is readily prepared by igniting ammonium chloroplatinate. It forms a porous mass which may be compacted and worked into metal of ordinary appearance and properties under the influence of pressure and heat. Of similar nature is platinum black, which is usually prepared by heating warm alkaline platinum solutions with some organic reducing agent. It absorbs more than 800 times its volume of oxygen, which acts as a vigorous oxidizer when in this condition, so that hydrogen or other inflammable gases may be spontaneously ignited under its influence. Platinum is permanent in the air under practically all conditions. It is not dissolved by any of the ordinary acids, but goes slowly into solution in aqua regia or other liquids which evolve chlorine. Platinum forms alloys with most of the metals, some of which, such as the alloy with 10 per cent iridium, have found use in the arts, especially for the purpose of making standard weights and measures. Metallic platinum is employed in making crucibles and similar utensils for laboratory use, and, as it is not attacked by acids, vessels composed of it have been used extensively in sulphuric-acid works. It also finds extensive application in the manufacture of incandescent electric lamps, as it is the only metal which possesses practically the same coefficient of expansion as glass and can be satisfactorily scaled into the glass at the base of the lamp. Probably one-half of the entire consumption is required in dentistry and in the manufacture of jewelry. Modern platinum settings for precious stones contain up to 25 per cent of iridium, which contributes strength and hardness, whereby very delicate but serviceable designs may be wrought.

Platinum forms a series of platinum compounds derived from the monoxide (PtO) and a series of platonic compounds derived from the hypothetical dioxide (PtO₂). The most important of the platinum salts is the platonic chloride or platinum tetrachloride, which is a brownish red deliquescent salt. This combines with metallic chlorides to form the well-known chloroplatinates of the type K₂PtCl₆. The common laboratory reagent obtained by dissolving platinum in aqua regia and evaporating with hydrochloric acid until the nitric acid is removed is a solution of chloroplatinic acid, from which the above-mentioned chloroplatinates are easily obtained by double decomposition. Of considerable interest to the chemist are also the so-called platinum bases, which are compounds of platinum salts with ammonia.

Metallurgy. All of the Russian platinum comes from placers and the greater part of it is obtained by dredging. The extraction of platinum from the ore consists first in concentrating

the ore by washing and removing the gold by amalgamation; the further treatment may be conducted either in the wet way or the dry way. The dry method does not yield pure platinum, but alloys of platinum with iridium and rhodium. The production of pure platinum requires the use of a wet method. Electrolysis is used to separate metallic platinum from its alloys with gold. Most of the platinum produced in the United States is separated in the refining of gold (electrolytic) at the mint or at private refineries. Two methods of dry extraction have been used. One consists in melting the ore in a vessel made of lime and remelting the button thus obtained; the second method is to melt the ore with galena and litharge in a reverberatory furnace and scorify the lead-platinum alloy obtained in order to remove the lead. Finally the platinum is fused into an ingot in the lime furnace. The wet method of extraction consists essentially in bringing platinum into solution with aqua regia, precipitating from this solution ammonium chloroplatinate by means of ammonium chloride and ammonia, and then decomposing the compound and volatilizing everything except the platinum at red heat. The wet method is the principal method of platinum refining now employed. Consult: J. L. Howe, *Bibliography of the Metals of the Platinum Group, 1748 to 1896* (Washington, 1897); Carl Schnabel, *Hand-Book of Metallurgy*, vol. 11 (New York, 1907); T. K. Rose, *The Precious Metals, Comprising Gold, Silver, and Platinum* (ib., 1909).

PLATNER, SAMUEL BALL (1863-). An American Latin scholar. He was born at Unionville, Conn., and graduated from Yale in 1883 (Ph.D., 1885). He taught at Western Reserve University after 1885, becoming professor of Latin in 1892. Platner served as secretary of the managing committee of the American School of Classical Studies in Rome (1897-1911), as professor in the school (1899-1900), and as president of the American Philological Association (1900-01). He edited *Selections from the Letters of the Younger Pliny* (1894) and published *The Topography and Monuments of Ancient Rome* (1903; 2d ed., 1911).

PLATO (Lat. from Gk. Πλάτων, *Platōn*) (c. 427-347 B.C.). A Greek philosopher, born on the island of Ægina, a dependency of Athens, where his father held an estate. His real name was Aristocles. His father claimed descent from Codrus (q.v.); his mother, Perictione, from Solon (q.v.). The known facts of his life are few. He received the education in music and gymnastics of a well-born Athenian youth, under the limitations imposed by the virtual state of siege created for Athens by the Peloponnesian War. His writings are sufficient evidence that he absorbed all the culture of his age—poetry, art, pre-Socratic philosophy, the Sophistic enlightenment (see SOPHISTS) in a synthesis, as Emerson says, "without parallel before or since." We may believe the tradition that he distinguished himself in gymnastics and wrote poetry. The poems he is said to have burned when, at the age of 20, he experienced the higher inspiration of the philosophic muse through his knowledge of Socrates.

For a youth of Plato's birth and endowments politics would have been the natural career. Two of his dialogues are named from his kinsmen Charmides and Critias, who were prominent in the oligarchy of the so-called Thirty

Tyrants which dominated Athens in the year 404-403. (See GREECE, *History*; TYRANT.) The experiences of that year disenchanted him forever with regard to the rule of the Fair and Good, as the Thirty called themselves. The judicial murder of Socrates (q.v.) by the restored democracy in the year 399 and the increasing license and weakness of popular rule through the fourth century further embittered his spirit and developed the conviction that all existing forms of government were mere partisan factions and that there was no hope of salvation for the cities of Greece until "either philosophers should become kings or kings philosophers." The philosopher whose lot was cast in fourth-century Athens could exercise active citizenship only in the city of the ideal, "of which a pattern is laid up in heaven"—the City of God of later Græco-Roman and early Christian idealism. The powers and social aspirations that might have made a great statesman and leader of men found expression in the *Republic* and the *Laws*, the masterpieces of Plato's maturity and old age. After the death of Socrates Plato is said to have left Athens and to have traveled extensively in Greece, southern Italy, Sicily, and even Egypt and northern Africa. About the year 388 he is said to have visited the court of Dionysius (q.v.) the Elder, tyrant of Syracuse, who, offended by his freedom of speech, contrived to have him sold into slavery at Ægina on his voyage home. The story adds that he was at once ransomed by friends. Modern conjectural scholarship tries to trace in Plato's writings the chronological succession of Megarian, Italo-Pythagorean, Egyptian, and Sicilian influences experienced in these voyages. But we really know nothing beyond the presumption that he was absent from Athens for a large part of the 10 years that followed Socrates' death. At the age of 40, about 387, he established the Academy (q.v.), which, with the rhetorical school of Isocrates (q.v.), made Athens in very deed the educator of Hellas, and was the beginning of that university life at Athens which continued for eight centuries. The name is derived from the hero Academus, adjoining whose shady precinct and gymnasium on the road to Eleusis, 1 mile from Athens, was the small estate which Plato dedicated to the uses of the school. By Plato's will the institution was probably perpetuated as a religious foundation sacred to the Muses, and this organization was imitated in the Lyceum of Aristotle, the garden of Epicurus, and the Museum of Alexandria. Here for 40 years Plato taught, debated high and subtle questions with his favorite pupils, and "curled and combed the styles of his dialogues" until his death in 347. Among his most famous pupils were Speusippus, his nephew, who succeeded him as scholar; Xenocrates, the successor of Speusippus; Aristotle (from the year 367), the orators Demosthenes, Hyperides, and Lycurgus, the astronomer Eudoxus of Cnidos, and many other eminent men from all parts of Greece. The inner life of the school we can only divine. From Plato's sneers at the Sophists, who took pay for spiritual gifts, we may infer that no tuition fees were exacted. We may conjecture that some of the most abstract and metaphysical dialogues, the *Parmenides*, the *Sophistes*, the *Politicus*, the *Philebus*, are idealizations of actual discussions in the school, as the *Charmides*, *Lysis*, *Protagoras*, and *Gorgias* are reflections of real conversa-

tions in the gymnasia and public resorts frequented by Socrates. A famous passage of the *Phaedrus* exalts the spoken above the lifeless written word; Plato, like those two other great artists in language, Renan and Ruskin, affected to hold mere literary virtuosity in light esteem. Contemporary writers of comedy represent the students of the Academy as dandified young coxcombs, and jest about the obscure idea of good, and the scientific definition of the cucumber by dichotomy. Plato was drawn into the turmoil of real life by his two visits to Syracuse in the years 367 and 366 and shortly after. The younger Dionysius (q.v.) had succeeded his father as tyrant of Syracuse, and Dion (q.v.), his kinsman by marriage, whose friendship Plato had won in his first visit, cherished the illusion that, under suitable guidance, the youthful ruler might develop into the philosopher king postulated in the *Republic*. The failure of the experiment, the banishment of Dion as its result, the expedition organized in the year 359 by Dion with the aid of pupils of the Academy against Dionysius, whom he drove into exile in turn, his assassination by his fellow pupil Callippus, and the anarchy into which Syracuse was plunged as a consequence, furnished abundant matter for those inclined to blaspheme philosophy and to scoff at the scholar in politics, and may plausibly be conjectured to have contributed to the mood of embitterment and disillusion that prevails in the great work of Plato's declining years, the *Laws*. The pathos of Plato's old age has been beautifully expressed by Wilamowitz (*Aristoteles und Athen*, vol. i, p. 330). But credible anecdotes illustrative of the esteem and love in which he was held by his fellow citizens and numerous pupils soften the picture. If some illusions were gone, the grasp of thought and the synoptic command of experience remained to the end. The *Laws* lacks the inimitable Attic grace of the *Symposium* and the *Phædo*, but the thoughtful reader finds compensation in the breadth of its survey of human life and Greek institutions, its intense moral and religious earnestness, the solemn detachment of its resigned and stately melancholy.

Plato's extant writings (including probably all he ever published) were arranged by the rhetor Thrasyllus (first century A.D.) in nine tetralogies, or groups of four. One member of the ninth group is constituted by the 13 letters which are almost certainly spurious, though some scholars now defend the genuineness of some of the letters, e.g., of the seventh epistle because of the interesting and plausible account which it gives of Plato's relations with the court of Syracuse. Of the 35 dialogues, the *Hyparchus*, on the love of gain; the *Erastæ* and the *Theages*, on philosophy; the *Minos*, on law; and the *Epinomis*, a sort of supplement to the *Laws*, are generally acknowledged to be spurious. Many reputable scholars still doubt the genuineness of the *Alcibiades I*, on the nature of man; the *Alcibiades II*, on prayer; the *Hippias I*, on the beautiful; the *Hippias II*, on falsehood; the *Ion*, on Homer and poetical inspiration; the *Menæxenus* or Funeral Oration; and the *Kleitophon*, a fragment. The acceptance or rejection of these seven minor works affects very slightly our total impression of Plato's thought and art.

The dialogues vary in length from the 22 pages of the *Crito* to the 418 pages of the *Laws*, and in manner from the lively dramatic repre-

sentation of a possible conversation in a Greek gymnasium (the *Lysis* on Friendship, the *Charmides* on Temperance) to the didactic exposition in perfunctory dramatic form of an obscure problem of logic or metaphysic (*Sophistes*, *Parmenides*), a theory of the universe (*Timæus*), or a project for the reformation of society, education, and law (*Republic*, *Laws*). The dialogue form arose naturally out of the Greek drama, the Athenian habit of discussion, and the use of the dialogue by Socrates. Its history has been written by Hirzel (*Der Dialog*, Leipzig, 1895). (See *DIALOGUE*.) It was employed by other disciples of Socrates as well as by Plato, and specimens of such dialogues are included in Xenophon's *Memorabilia* of Socrates. The form is sometimes purely dramatic, as in the *Euthyphro*, on holiness, or in the *Gorgias*, on rhetoric; sometimes, as in the *Republic*, it is that of a narrated dialogue, which permits description and comment, as in the modern novel. Socrates is the principal speaker in all except the *Sophistes*, *Politicus*, *Parmenides*, *Timæus*, *Critias*, and the *Laws* (in the *Laws* he does not appear at all).

One of the chief problems of recent Platonic scholarship is the determination of the dates of the dialogues through statistical study of the style (Lutoslawski, *Origin and Growth of Plato's Logic*), by tracing the development of Plato's thought, or by the aid of casual historical allusions. The results, though affirmed with confident dogmatism, cannot be verified. The *Laws* and the *Timæus* are known to be late. The *Republic* belongs to Plato's middle age. The minor dramatic dialogues are presumably as a whole early. The severely metaphysical *Sophistes*, *Politicus*, and *Philebus* probably follow the *Republic* rather than precede it, as older scholars believed. But the unity and consistency of Plato's thought as a whole, and the tradition that he revised and corrected his greater works to the end, lessen the significance of these researches.

The perennial charm of Plato resides precisely in the baffling combination which he presents of consummate artist and subtle metaphysician. We may say roughly that the dialogues have three chief aims: (1) the ideal portraiture of the master Socrates (see *SOCRATES*), (2) the dramatic portrayal of the practice of discussion, the game of question and answer, as it has been called, which played so large a part in Athenian life (see *DIALOGUE*; *DIALECTIC*); (3) the exposition of doctrine. Plato is the Shakespeare of ideas. All ideas are allowed to speak for themselves on his stage with something of the dramatic fairness that seems to justify every personage, from his own point of view, upon the stage of Shakespeare. And, though it is not so difficult to determine in this dramatic conflict of ideas the beliefs seriously defended by Plato as it is to observe the habitual preferences, that define Shakespeare's personality, it is still very difficult. The hasty reader will accept as Platonic definitions, distinctions, arguments, and fallacies that have a purely dramatic significance. He will interpret as marking stages in the development of Plato's own thought professions of ignorance or bewilderment which the Socratic irony employs merely to ensnare pretentious self-sufficiency, to stimulate youthful thought, or as a dramatic prelude to the favorite Socratic moral: "Let us re-examine the whole question together." He will take literally

Socrates' affectation of following whithersoever the wind of discussion may blow, and, dazzled by the kaleidoscopic shiftings of suggestion and interesting ideas, he will be skeptical of the existence of any underlying unity of thought and purpose.

Instead of falsifying Plato's teaching by forcing it into the framework of an artificial system, it is better simply to enumerate a few of the dominant conceptions and aims that preserve its unity and consistency amid all its apparent variations. There is first dialectic—the faith which he shared with Socrates in the value of rational discussion, if not as the organon of absolute truth, at least as the only protection against the errors and confusions of untested opinion. Both Plato and Socrates believe that, as John Stuart Mill phrases it, "there is no knowledge, and no assurance of right belief, but with him who can both confute the opposite opinion and successfully defend his own against confutation." Many of the most entertaining passages of the dialogues are mere dramatic illustrations of the inability not only of the average man but of the most brilliant sophists and rhetoricians of the day to do this (*Gorgias*, *Protagoras*). They could bandy abstractions implying praise or blame and discourse eloquently of virtue and the education that fitted men for life. But they could not define the terms they used or defend the coherency and consistency of their opinions against objectors. They were unable to make the preliminary distinctions and classifications requisite for the intelligent discussion of such questions as Can virtue be taught? (*Meno*) or Is pleasure or knowledge the good? (*Philebus*). They had opinions, but no knowledge. Dialectic was said to have been invented by Zeno, the author of the famous fallacies disproving motion; and the Athenians of the fifth century were subtle and skillful disputants. But the rules of the game (the principles of elementary logic) had never been formulated, and Socrates was the first to play it with system and conscious mastery. He demanded definitions of general terms and confirmed or refuted them by apt induction and generalization from simple pertinent instances. So great was his skill that, as Xenophon affirms and Plato illustrates, he could deal with an opponent as he pleased. None could escape the net-work of argument which he wove. Plato inherited from Socrates his intense conviction of the difference between untested opinion and reasoned knowledge, and, starting from the Socratic logic of the definition and simple induction, he worked out in concrete examples the details of the logic of consistency so that all that remained for Aristotle was to codify them and add the formulas of the syllogism. In the prosecution of this task Plato was confronted by certain quibbles about being and not being, the one and the many, the whole and the part, rest and motion, the reality or unreality of abstract ideas, which from one point of view are mere verbal fallacies, from another are problems of psychology and metaphysics. To interpret aright the more metaphysical and abstract dialogues, we must remember that, whether Plato succeeded or failed in solving metaphysical problems which are still debated, he never lost sight of his main object, the removal of the verbal fallacies from the pathway of practical logic. Familiarity with the Aristotelian logic makes this seem a trifle to us. But to ac-

complish it for the first time was one of the greatest achievements of human genius.

A second fundamental Platonic thought is the postulate that the art of conduct, of individual and social life, ought to be as truly scientific as are the various arts and sciences that deal with material things. To emphasize this thought, Plato makes use of the favorite Socratic comparison or confusion of the virtues and the arts. As there is an art of carpentry or shoemaking known only to him who has mastered it, so virtue, the art of happiness, of conduct, the political or royal art, must be conceived as a specific form of knowledge demanding a special training in its possessor. To the end or aim of the royal art all partial and particular ends would be subordinated—it would be an idea of good in which all particular goods, virtues, and utilities have their ground. Many of the minor dialogues illustrate the inability of the average disputant to apprehend any such larger end or to define particular virtues and ends in relation to it. Others refute the pretensions of the sophists, rhetoricians, and politicians who claim to teach or practice the art of life and government, but in fact teach only the opinions of the multitude—the humors of the many-headed beast, or the knack of persuasive speech, or the tricks by which the politician seizes the helm of the ship of state, though he has never learned to steer. Even the few virtuous and judicious statesmen of whom Athens boasts are guided, not by knowledge, but by right opinion or happy instinct, which, in the corruption of the existing social order and the absence of all systematic and effective teaching of virtue, must be said to come to them by grace divine (*Meno*).

The *Republic* contains the positive and constructive application of these ideas. There Plato expounds his ideal of a city in which the end of government is not the domination of a faction, nor the multiplication of wealth, nor doing as one likes, but the virtue and consequently the true happiness of the individual citizen and the order and harmony of the whole. The chief means to this end is justice—the division of labor generalized to mean the proper distribution of function among the three faculties of the soul, the appetites and desires, the emotions and passions, and the ruling reason, and answering to this the severe limitation to their proper work of the corresponding groups of the population—the industrial, the military, and the governing classes—determined by birth only in so far as birth is found to involve natural aptitude. The rulers, the embodied reason of the state, are selected by severe tests from the warriors. Absolute disinterestedness is secured by forbidding them to hold private property and by the paradoxical community of wives and offspring. In order to master the political art they must supplement the ordinary education in music and gymnastics by a prolonged discipline in mathematics, astronomy, and dialectic, which, as Plato expresses it in a poetical figure, the source of much later mysticism, will enable them to apprehend the idea of good, the cause of light and truth and being in the intelligible world, as the sun is in the world of matter. In the *Republic*, as everywhere, the logical skeleton of Plato's ethical and political theory is clothed with an eloquence nobly employed in the assertion of the ideal aims of life as against base, sensuous, and sordid views of happiness

and success. And many readers who care nothing for the abstract logic of Plato's ethical philosophy will be charmed or inspired by the preacher and prophet—his impassioned faith in the moral order of the world, his denunciation of materialistic, sensationist, and hedonistic philosophies, his affirmation in poetical myth and allegory of the hope of immortality and the inevitableness of the judgment of God.

A word must be said of the theory of ideas with which most expositors of Plato begin and which might be made the centre of the Platonic philosophy. Taken literally, it is the assertion of the astounding paradox that reality belongs not to the individual thing, this book, this tree, this man, but to the general idea of book, tree, or man. The individual things are but the fleeting, perishable copies of the form or idea, which abides in changeless unity forever and is the sole object of real knowledge. Primarily this is merely a paradoxical logic of general terms, which, employed with Plato's unflinching consistency, serves as well as the reverse mode of speech that alone seems reasonable to us. In the second place, it is a manifestation of the plasticity of the Greek imagination, which in Plato, as in the mythology and on the stage of Aristophanes, refuses to deal with ideas as algebraic counters, but, since they are real forces in thought, life, and speech, treats them as veritable things and persons. In the third place, it is a metaphysical doctrine with regard to the noumenon, or reality behind the veil of sense, which all philosophies that acknowledge an absolute, whether in being or cognition, are compelled to assume. Only those who are willing to affirm that sense is all can consistently condemn as absurd Plato's assertion that ultimate realities are more akin to our ideas than to our sensations and perceptions. Many passages show that Plato saw, as clearly as his modern critics see, the conflict of this doctrine with common sense. But metaphysics is not common sense. The ideas were the only alternative, he thought, to the philosophy of Heraclitus (q.v.), that all things are in perpetual flux, which Plato interpreted to mean, in modern phrase, that reality is merely "the permanent possibility of sensation." It is because he would not accept this doctrine that Plato clung to the ideas; not, as we are so often told, because in the infancy of human thought he did not understand the processes of generalization and abstraction.

Associated with the theory of ideas is the poetical doctrine of reminiscence or recollection. The soul has beheld the ideas in a previous stage of existence. "Our birth," as Wordsworth says, "is but a sleep and a forgetting." Learning, experience, is the re-collection of the ideas through the suggestions and association of their imperfect copies in this world. We have never seen two things absolutely equal, but we recollect the idea and ideal of pure equality from the proximate equals of experience. Mathematical truths can be elicited from an uneducated man by skillful questioning (*Meno*). The idea of beauty alone has a not wholly inadequate embodiment on earth. Hence the peculiar ecstasy of the thrill which the aspect of beauty stirs in the lover. It awakens immortal memories of the soul's beatific vision of the idea.

Plato's writings exercised an inestimable influence on Aristotle, the Stoics, Cicero, Plutarch, the Neoplatonists, the Christian Fathers, the

earlier scholastics, the philosophy and poetry of the Renaissance in Italy and England, and on the nineteenth-century revival of historical and philosophical studies in Germany. His influence is rather increasing than diminishing in the higher literature and scholarship of our own time. Nor is it likely soon to wane. To borrow his own half-mystical imagery, he purges the eye of the soul, that it may discern spiritual truth, and converts it from the observation of the transient shadows of the fire-lit cave to the contemplation *sub specie aeternitatis* of the abiding forms of pure being illumined by the idea of good.

Bibliography. The best critical edition of the text is that of Schanz, still incomplete. Good and convenient texts abound—in the Teubner Series, in the Didot Bibliotheca, and that now in course of publication at Oxford. The chief complete annotated edition is that of Stallbaum with Latin notes (12 vols., 1821-28), parts of which have been reëdited by other scholars. Campbell's *Theætetus*, *Sophistes*, and *Politicus*, Jowett and Campbell's *Republic*, Archer Hind's *Phædo* and *Timæus*, Bury's *Philebus*, and Adam's *Republic* are well known. School and college editions of the *Apology* and *Crito*, the *Protagoras*, *Gorgias*, *Meno*, and *Euthyphro* abound. Jowett's translation (3d ed.) supersedes all others for English readers. Another good translation, by H. N. Fowler, is in progress in the Loeb Classical Library (New York, 1913 et seq.). Grote's four volumes of summary and comment cite the literature down to the year 1866. The volume on Plato in the last edition of Zeller's *History of Greek Philosophy* is a full, scholarly treatment of the whole subject. Professor Ritchie's *Plato* (New York, 1902) is a readable sketch. For the right understanding of Plato, however, the best guide is Mill's review of Grote (*Dissertations and Discussions*, vol. iv, p. 227), supplemented where unsympathetic by Walter Pater, *Plato and Platonism* (New York, 1893), and Emerson's essay on *Representative Men*. Consult also: Theodor Gomperz, *Greek Thinkers*, vols. ii, iii (Eng. trans. by G. G. Berry, New York, 1905); J. A. Stewart, *The Myths of Plato* (London, 1905); J. E. Sandys, *A History of Classical Scholarship* (3 vols., Cambridge, 1906-08); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); J. A. Stewart, *Plato's Doctrine of Ideas* (Oxford, 1909); A. E. Taylor, *Plato* (ib., 1908); P. E. More, *Shelburne Essays*, 6th series (New York, 1909); J. Adam, *The Religious Teachers of Greece* (2d ed., Edinburgh, 1909); C. Ritter, *Platon: sein Leben, seine Schriften, seine Lehre*, vol. i (Munich, 1910); id., *Neue Untersuchungen über Platon* (ib., 1910); A. E. Taylor, *Varia Socratica* (Oxford, 1911); Paul Shorey, *The Unity of Plato's Thought* (Chicago, 1903); id., numerous reviews of books on Plato in *Classical Philology*, vols. i-ix (ib., 1906-14), and especially "Plato's Laws and the Unity of Plato's Thought," Part I, in *Classical Philology*, ix (ib., 1914); Christ-Schmid, *Geschichte der griechischen Literatur*, vol. i (5th ed., Munich, 1908; vol. i, part i, 6th ed., 1912).

PLATO'DA. See PLATYHELMINTHES.

PLATONIC BODIES. See POLYHEDRON.

PLATO OF TIVOLI, or TIBURTINUS (c.1120). A translator of Arabic mathematical manuscripts. He is known chiefly for his translation of the trigonometry and astronomy of

Al Battani. Among his contemporaries are Gherardo of Cremona, Athelard of Bath, and John of Seville, likewise known for their translations of Arabic mathematical manuscripts into Latin.

PLATOON' (Fr. *peloton*, platoon, tennis ball, dim. of *pelote*, OF. *pelote*, *pelotte*, ball, from ML. *pilota*, dim. of Lat. *pila*, ball). A term formerly used to designate a body of troops who fired together. In its modern sense, in the United States army, it is applied to one of the two, three, or four subdivisions into which a single company may be divided. A platoon, in war, must not consist of less than two nor more than four squads. A squad is eight men. Platoons are assigned to the lieutenants and non-commissioned officers, in order of rank, as follows: 1, right; 2, left; 3, right centre; 4, left centre. In the same way the word "platoon" is used to designate the main subdivisions of a battery of artillery or of a troop of cavalry.

PLATOV, plát'of, MATVEI IVANOVITCH, COUNT (1751-1818). A Russian general. He was born on the banks of the Don, August 17 (6), 1751, and was of Greek descent. Entering the Russian army in 1765, he distinguished himself in the wars against Turkey and France, so that in 1801 he was appointed by Alexander I hetman of the Cossacks and lieutenant general. In the War of 1812, after the French had evacuated Moscow, Platov hung upon their rear with the utmost pertinacity, and French historians state that Napoleon's army suffered more from him than from privation and exhaustion. After crossing the Prussian frontier Platov occupied Marienwerder and other cities. On May 28, 1813, he defeated Lefebvre at Altenburg. To the French, retreating from Leipzig, he showed no mercy, and subsequently he gained a victory over them at Laon. In 1814 he took Nemours and later entered Paris with the allies. His undisciplined bands committed depredations everywhere, but the leader was loaded with honors. Alexander made him Count in 1812. A monument to him was erected at Novoherkassk on the Don. Consult Aubin, *Trente-neuf portraits* (St. Petersburg, 1902).

PLATT, CHARLES ADAMS (1861-). An American landscape architect, painter, and etcher. He was born in New York City and studied at the schools of the National Academy of Design and the Art Students' League. In 1882 he went to Paris, where he worked for four years under Boulanger and Lefebvre and exhibited at the Salon. His early paintings, largely views of New England, are smooth of surface, but truthful in color and sympathetically handled. Among the best are "Clouds," which was awarded the Webb prize offered by the Society of American Artists (1894), and "Snow" (1900). Later he turned to landscape gardening and architecture. As an etcher he produced some excellent work, especially in his treatment of water, selecting his subjects principally from the life of Dutch fishermen and from scenes in Holland. He is the author of *Italian Gardens* (1892) and was made a National Academician in 1911.

PLATT, ORVILLE HITCHCOCK (1827-1905). An American statesman, born at Washington, Conn. He was educated at Gunn's Academy, Washington, studied law at Litchfield, Conn., and was admitted to the bar in 1849. He practiced law at Meriden, was clerk of the State Senate in 1855-56, and the next year was

Secretary of State of Connecticut. He was elected as a Republican to the State Senate for the term 1861-62, and to the State House of Representatives in 1864 and 1869, the latter year being chosen Speaker. On March 18, 1879, he succeeded William H. Barnum, Democrat, in the United States Senate, where he continued to serve until his death. He received the Yale LL.D. in 1887. On Feb. 25, 1901, he reported from the Committee on Relations with Cuba an amendment, famous as the Platt Amendment, to the Army Appropriations Bill, which stated in part "That the Government of Cuba consents that the United States may exercise the right to intervene for the preservation of Cuban independence, the maintenance of a government adequate for the protection of life, property, and individual liberty." This amendment, framed by Platt and Senator Spooner, was of far-reaching importance in regulating the relations of the two countries. Under it the United States intervened twice in Cuba (q.v.), and it was thought by some that it virtually established a protectorate; but the authors denied any such intention. The amendment was accepted by Cuba and made a part of the constitution. Because of his votes against the Sherman Anti-Trust Law, the Eight-Hour Labor Act, and the Anti-Injunction Bill, Platt was denounced by the labor organizations and was considered a reactionary. Consult L. A. Coolidge, *An Old-Fashioned Senator: Orville H. Platt* (New York, 1910).

PLATT, THOMAS COLLIER (1833-1910). An American political leader. He was born at Owego, N. Y., studied at the Owego Academy, and entered Yale College in 1849, but withdrew in his junior year on account of ill health. He then went into business as druggist, became president of the Tioga National Bank, and invested largely in lumbering in Michigan. He was clerk of Tioga County in 1859-61 and a member of Congress from 1872 to 1876. In 1870 he became the friend and political ally of Conkling and a subordinate leader in the Republican party. In 1879 he was made secretary and director of the United States Express Company and in 1880 became its president. He also acted as president of the Southern Central and other railways. In 1880 he was appointed a quarantine commissioner at the port of New York. In 1881 he was elected United States Senator, but within a few months both he and Senator Roscoe Conkling, his colleague from New York, resigned because President Garfield did not defer sufficiently to their wishes in making appointments in New York. Platt claimed that he "induced" Conkling to resign, although the latter wanted to fight the matter out in the Senate. The immediate occasion of their resignation was the appointment by Garfield of W. H. Robertson as collector of the port of New York City. (See CONKLING, ROSCOE; ROBERTSON, W. H.) In an appeal to the Legislature for reelection they were both defeated, although Platt withdrew before the final vote. After the defeat of Conkling, however, Platt gained virtual control of the Republican organization in New York, becoming finally the so-called "easy Boss," and was again elected to the Senate in 1897 and 1903. He was a delegate to all the Republican national conventions from 1876 until his death, as well as a member of the National Republican Committee. He claimed that he secured the nomina

tion of Roosevelt for Governor of New York and that he practically forced the latter to accept the nomination for Vice President in 1900. The relations of Platt and Roosevelt were discussed at length in the Roosevelt-Barnes libel suit of 1915. Consult L. J. Lang (ed.), *The Autobiography of Thomas Collier Platt* (New York, 1910). See ROOSEVELT, THEODORE.

PLATTDEUTSCH, plät'doich, or Low SAXON. The language spoken in northern Germany from the border of Holland to the frontier of Lithuania. It is distinguished on the one hand from Low Franconian, which includes the language of Holland, Dutch proper (see DUTCH LANGUAGE), and on the other hand from Middle and Upper German, which are grouped together under the name High German. In common with other Low German languages, Plattdeutsch is distinguished from High German by the fact that its surd mutes have not passed through the second or High German sound shifting. (See GRIMM'S LAW) There is, however, no definite line of demarcation, some of the Middle German dialects not having shifted *p* and *t*. The best criterion of distinction is the so-called *ich-line* which starts on the Belgian border south of Limburg and runs in a northeasterly direction, crossing the Rhine at Benrath (between Düsseldorf and Cologne), the Elbe south of Magdeburg, the Oder just above Frankfurt, and finally reaches the Slavic frontier in the Province of Posen near Birnbaum. To the north of this line the first personal pronoun has the form *ik*, to the south *ich*. Within its district Plattdeutsch is generally spoken by the lower classes, while High German is the language of the school and pulpit and, as a rule, of the educated classes.

Plattdeutsch is not a homogeneous language, but consists of a number of different dialects which may be divided into two main groups: (1) Northeast Saxon, in Oldenburg, Bremen, Hamburg, Hanover, Brunswick, Holstein, Mecklenburg, Brandenburg, Pomerania, and East Prussia; (2) Westphalian, in Westphalia and the Principality of Waldeck. During the nineteenth century the dialect of Mecklenburg acquired especial prominence through the writings of Fritz Reuter.

Historically Low Saxon is divided into (1) Old Saxon or Old Low German, extending from the ninth to the twelfth century, (2) Middle Low Saxon, from the twelfth to the end of the sixteenth century, (3) Modern Low Saxon, Plattdeutsch, or Modern Low German, from 1600 to the present time.

In the Old Saxon period the principal literary monument is the *Heland* (q.v.), a religious epic of nearly 6000 lines in alliterative verse, written about 830 at the request of Louis the Pious. Several fragments of a versification of the first chapters of the Book of Genesis, an interlinear version of the Psalms, and various other smaller fragments of a religious character have been preserved, besides a number of glosses and proper names. Old Saxon may also lay partial claim to the *Hildebrand's Lay*, the most famous of all old German ballads, as it is written partly in this dialect.

The most noted prose document of the Middle Low Saxon is the *Sachsenspiegel*, a compilation of Saxon common law, made by Eyke von Repchow between 1224 and 1230, and which became the model for law books in other parts of Germany. From 1350 through the fifteenth century

there is an extensive Low German literature, which is mainly religious in character, consisting largely of legends of the Church and collections of hymns. Among secular poems may be mentioned *Reineke der Vos* (Lübeck, 1498) and *Flore und Blankfur*. About the middle of the seventeenth century Low Saxon ceased to be a literary language, the last Low Saxon Bible appearing at Goslar in 1621. In modern times what little literature has appeared has been of a decidedly dialectical character. Especially prominent are Fritz Reuter (q.v.), best known for his humorous novel *Ut mine Stromtid* and the poem *Hanne Nute* and Klaus Groth (q.v.), a writer of lyric poems, as the *Quickborn*.

Bibliography. August Marahrens, *Grammatik der plattdeutschen Sprache* (Altona, 1858); Julius Wiggers, *Grammatik der plattdeutschen Sprache* (2d ed., Hamburg, 1858); H. Eschenhagen, *Zur plattdeutschen Sprache* (Berlin, 1860); Gilow, *Leitfaden zur plattdeutschen Sprache* (Anklam, 1868); Schiller and Lübken, *Mittelniederdeutsches Wörterbuch* (6 vols., Bremen, 1871-81); Gustav Dauneh, *Ueber die niederdeutsche Sprache und Litteratur* (Berlin, 1875); *Jahrbuch des Vereins für niederdeutsche Sprachforschung* (Leipzig, 1875 et seq.); Heinrich Berghaus, *Der Sprachsschatz der Sassen: ein Wörterbuch der p'atdeutschen Sprache* (3 vols., Brandenburg, 1880-84); August Lübken, *Mittelniederdeutsche Grammatik* (Leipzig, 1882); Lübken and Walther, *Mittelniederdeutsches Handwörterbuch* (Norden, 1885-88); Rudolf Eckart, *Leikon der niedersächsischen Schriftsteller* (Osterwick, 1891); Mentz, *Bibliographie der deutschen Mundartenforschung* (Hamburg, 1892); Gädertz, *Das niederdeutsche Schauspiel* (ib., 1894); Jellinghaus, "Mittelniederdeutsche Literatur," and Kogel and Brunker, "Geschichte der althoch- und altniederdeutschen Litteratur," in Hermann Paul, *Grundriss der germanischen Philologie*, vol. ii (Strassburg, 1897); Ferdinand Holthausen, *Altsächsisches Elementarbuch* (Heidelberg, 1899); J. H. Gallée, *Altsächsische Grammatik* (Halle, 1910).

PLATTENSEE, plät'ten-zä The largest lake of Hungary. See BALATON, LAKE

PLATTER, plät'ter, THOMAS (1490-1582). A Swiss printer, scholar, and educator, born near Visp, in Canton Valais. He was a goatherd in his boyhood, then saw Germany as a traveling scholar, and later studied under Myconius at Zurich. He labored as a ropemaker at Basel at the same time that he was serving as professor of Hebrew and (later) of Greek. For six years he maintained a printing establishment. His autobiography, written at his son's request in 14 days, when the father was 73, gives a remarkable picture of the times, supplemented by that of his son, FELIX PLATTER (1536-1614), a doctor of medicine and instructor at Basel. The two biographies were edited by Heman (Gütersloh, 1882). Consult Paul Mourde, *Thomas Platter and the Educational Renaissance of the Sixteenth Century* (New York, 1904).

PLATTE (plät) **RIVER**. The principal river in Nebraska and in respect of the area which it drains (about 84,600 square miles) the most important tributary of the Missouri. It is formed by the North and South Platte rivers, which unite in Lincoln Co., Neb. (Map: Nebraska, G 3).

The North Platte rises in the mountains which surround North Park in northern Colo-

rado, flows northward into Wyoming, turns southeast to its junction with the South Platte. At Pinkhampton, Colo., the stream is about 8000 feet above the sea level. Its length is about 650 miles, and its drainage basin includes about 28,500 square miles, of which about 20,000 are in Wyoming and 7000 in Nebraska.

The South Platte rises near the centre of Colorado. Its drainage basin includes about 24,000 square miles and contains the oldest cultivated and irrigated areas in Colorado. From the junction of the North and South Platte rivers the main stream flows eastward across Nebraska for somewhat more than 200 miles and enters the Missouri at Plattsmouth, about 10 miles south of Omaha. Its western reaches are extensively used for irrigation. It is too shallow for commercial navigation.

PLATTEVILLE. A city in Grant Co., Wis., 135 miles west by south of Milwaukee, on the Chicago, Milwaukee, and St. Paul and the Chicago and Northwestern railroads (Map: Wisconsin, C 6). It is the seat of a State normal school, the State School of Mines, and a State school for the deaf, and it contains a Carnegie library. The surrounding country is agricultural, with important mining interests. Zinc mining, recently developed, has attained great importance. Several large zinc and lead mines are worked in or near the city. There are also manufactories of wagons, creamery products, beer, cigars, etc. The water works are owned by the municipality. Platteville was settled in 1827. Pop., 1900, 3340; 1910, 4452.

PLATTNER, plát'nēr, KARL FRIEDRICH (1800-58). A German metallurgist, born at Kleinwaltersdorf, Saxony. He was educated at Freiberg, and, having become an inspector and assayer for the royal mines in Saxony, worked out methods of blowpipe analysis for metals. In 1840 he became chief of the royal department of assaying and in 1842 was made professor of metallurgy at the Bergakademie of Freiberg. His *Die Probierkunst mit dem Lötrohr* (1835; 7th ed., 1907) was translated into English as *Manual of Qualitative and Quantitative Analysis with Blowpipe* (8th ed., 1902).

PLATTNER PROCESS. See CHLORINATION; GOLD.

PLATTSBURG. A city and the county seat of Clinton Co., N. Y., 167 miles north by east of Albany, on Lake Champlain, at the mouth of the Saranac River, and on the Delaware and Hudson and the Chateaugay railroads (Map: New York, G 1). It is picturesquely situated on Cumberland Bay, which affords a fine harbor, and is an attractive resort as well as the centre of a large territory popular in summer. Plattsburg is the seat of a State normal and training school and has a public library and four other libraries. The Plattsburg Barracks (q.v.) are among the largest in the United States. There are also the Federal government building, the courthouse and jail, a monument to Samuel Champlain, and homes for aged women and for friendless children. The Catholic Summer School of America (q.v.) convenes at Cliff Haven, 2 miles south of the village. Plattsburg is a port of entry of the St. Lawrence customs district, the trade of which in 1915 comprised exports valued at \$32,257,643, and imports to the amount of \$28,275,724. It controls extensive lumber interests, and among its industrial establishments are lumber mills, wood-pulp mills, foundries

and machine shops, flouring and woolen mills, manufactories of sewing machines, wall paper, toilet paper, etc. The water works are owned and operated by the municipality. Pop., 1900, 8434; 1910, 11,138; 1915 (State census), 10,360.

Plattsburg was settled in 1784 by a company from Poughkeepsie and Long Island, headed by Zephaniah Platt, and was incorporated in the following year. Off Valcour Island, near by, on Oct. 11, 1776, occurred the first naval battle ever fought between British and American fleets. During the War of 1812 Plattsburg was the headquarters of the United States forces on the northern frontier, and on Sept. 11, 1814, in Plattsburg bay, Commodore Macdonough defeated a British fleet in the famous battle of Lake Champlain (see CHAMPLAIN), while on the land General Macomb repulsed a superior British force. In 1849 and again in 1867 Plattsburg suffered severely from fire, the greater part of the business portion being destroyed each time. A government military training camp was held at Plattsburg in 1915. Consult Palmer, *History of Plattsburgh* (Plattsburg, 1877).

PLATTSBURG BARRACKS. A United States military post, established in 1838 and occupying a reservation of about 703 acres in extent, on the west side of Lake Champlain, on the southern edge of Plattsburg, N. Y., and reached by the Delaware and Hudson Railroad. The post has quarters for a regiment of infantry, which is the usual garrison. Plattsburg Barracks frequently has been selected as the site of a practice camp for college and business men undergoing special military instruction in summer. United States troops were first stationed on the ground in 1812.

PLATTSMOUTH. A city and the county seat of Cass Co., Neb., 18 miles south of Omaha, on the Missouri River at the mouth of the Platte and on the Missouri Pacific and the Chicago, Burlington, and Quincy railroads (Map: Nebraska, J 3). It has a public library, and among its finest buildings are the courthouse, opera house, and the high school. The industrial establishments include the Burlington Railroad shops, brick and terra-cotta works, and cigar factories. There is considerable trade with the tributary region, which is interested mainly in agriculture and stock raising. Platts-mouth is governed by a mayor, elected biennially, and a unicameral council. Pop., 1890, 8392; 1900, 4964; 1910, 4257.

PLATYCERAS, plát-tis'ēr-as (Neo-Lat., from Gk. πλατύς, *platys*, flat, broad + κέρας, *keras*, horn). A genus of fossil snail shells of the gastropod family Capulidae, found in rocks of Upper Cambrian to Triassic age. They are shaped somewhat like a liberty cap with the apex of the shell enrolled in a close spiral of small size and with the outer or body whorl of the shell rapidly enlarging to an irregularly expanded aperture. *Platyceras* is most abundant in the Niagaran, the Devonian, and the Subcarboniferous formations, and the genus is more or less an index fossil of Devonian age. The genus *Orthonychia* includes straight or slightly rounded platycerid shells of Silurian to Carboniferous age. Consult: Keyes, "The *Platyceras* Group of Paleozoic Gastropods," in *American Geologist*, vol. x (Minneapolis, 1892); "Attachment of *Platyceras* to Palaeocrinoidea, and its Effect in Modifying the Form of the Shell," in *Proceedings of the American Philo-*

sophical Society, vol. xxv (Philadelphia, 1888); J. M. Clarke, "The Beginnings of Dependent Life," in *New York State Museum Bulletin*, No. 121 (Albany, 1908).

PLATYCRINUS (Neo-Lat., from Gk. *πλατύς*, *platys*, flat, broad + *κρίνον*, *krinon*, lily). A genus of crinoids of the order Camerata that appears in the American Devonian strata and is abundant in the Lower Carboniferous. It is the typical genus of the family Platycrinidae, which are characterized by their ring of five large plates without special anal plate. See CRINOIDEA.

PLATYHELMINTHES (Neo-Lat. nom. pl., from Gk. *πλατύς*, *platys*, flat, broad + *ἐλμύς*, *helmys*, worm), or **PLATODA**. A phylum of invertebrate animals (flatworms), easily recognized by the absence of a body cavity and anus. There is no blood system, the results of digestion being carried to the different parts of the body by branches of the intestine. The body is flattened dorsoventrally, so that it is often thin and leaflike. The surface is covered with cilia in most of the free-living forms, but in parasitic forms is usually smooth and somewhat chitinous. The muscular system is well developed and remarkably complex, so that almost any sort of movement is possible to these worms. The digestive system is usually very well developed and highly varied, but in some forms is wholly wanting. The nervous system consists of a ganglion above the œsophagus, and two lateral nerve cords, connected by transverse commissures. Other longitudinal trunks are sometimes present, and rarely the transverse commissures are wanting. A very characteristic and remarkable set of fine tubes ramifies through the body and apparently serves as an excretory system. Sense organs of various kinds occur in the free-living forms, but are usually wanting in those which are parasitic. Occupying a large part of the body and often nearly the whole space inside the skin, are the reproductive organs, and the fertilization of the egg is in almost all cases internal. The Turbellaria are hermaphroditic. The eggs are very numerous, provided with considerable yolk and covered by a shell, but some planarians multiply by fission, and when cut in pieces each piece may eventually become a well-formed planarian. The young undergo a metamorphosis and development sometimes very complex. The phylum is usually divided into three classes: (1) Turbellaria, free-living flatworms, with the surface ciliated; (2) Trematoda, parasitic, usually leaflike, flatworms having a well-developed digestive system; (3) Cestoda, the tapeworms, usually elongated, jointed, and without a digestive system. Consult Benham, in Sir E. R. Lankester, *Treatise on Zoology*, vol. iv (London, 1901), and Parker and Haswell, *Textbook of Zoology* (New York, 1910). See CESTODA; FLATWORM; TREMATODA.

PLATYPUS. See DUCKBILL.

PLATYRRHINI. The American monkeys. See MONKEY.

PLATYSTROPHIA (Neo-Lat. nom. pl., from Gk. *πλατύς*, *platys*, broad, flat + *στροφίον*, *strophion*, band). A hinged brachiopod very abundant and eminently characteristic of the Middle Ordovician formations, of which it is a well-known index fossil. Its shell is transversely elongated, with a long straight hinge line and low hinge areas. The convex valves are of about equal size, and their surfaces are marked by a number of strong angular radiating

folde. Two species, *Platystrophia lynce* and *biforata*, with numerous varieties, are common in the Trenton and Cincinnati groups of North America and in equivalent strata of Europe and elsewhere. This genus was originally included under *Orthis*.

PLAUEN, *plou'en*. A town of Saxony, Germany, on the White Elster, 21 miles southwest of Zwickau (Map: Germany, E 3). Most of its public buildings are modern. Among the most noteworthy are the castle, dating from the seventeenth century, the Rathaus, and the theatre. The educational institutions include a Gymnasium, a Realschule, a seminary for teachers, and a number of special schools. Plauen occupies a prominent place among the manufacturing cities of Germany, being the chief centre for the production of white cotton goods, viz., lace curtains, muslin, cambric, mull, batiste, various embroidered goods, etc. It also manufactures machinery, safes, pianos, paper, beer, etc. The population of the town increased from 73,801 in 1900 to 121,272 in 1910. The inhabitants are principally Protestants. The manufacturing of white goods was introduced at the end of the sixteenth century from Switzerland.

PLAUTIA, *plá'shi-á*, (or **PLOTIA**) **GENS**. A Roman plebeian gens, several members of which became consuls. It embraced the family names Hypsæus, Proculus, Silvanus, Venno, and Venox.

PLAUTUS, **TITUS MACCIUS**. The greatest comic poet of ancient Rome. He was born c.254 B.C. at Sarsina, a village of Umbria. It is probable that he came to Rome while still a youth and there acquired a complete mastery of the Latin language in its most idiomatic form as well as an extensive familiarity with Greek literature. It is uncertain whether he ever obtained the Roman franchise. His first employment was with the actors, in whose service he saved an amount of money sufficient to enable him to commence business on his own account. What the nature of this business was, or where he carried it on, we are not informed; we know, however, that he failed in it and returned to Rome, where he had to earn his livelihood in the service of a baker, with whom he was engaged in turning a hand mill. (Consult Aulus Gellius, *Noctes Atticæ*, iii, 3.) At this time—a few years before the outbreak of the second Punic War—he was probably about 30 years of age; and while employed in his humble occupation he composed three plays, which he sold to the managers of the *ludi*, or public games. (See GAMES, ANCIENT.) The proceeds enabled him to leave the mill and turn his hand to more congenial work. The commencement of his literary career may therefore be fixed c.224 B.C., from which date he continued with wonderful fertility to produce comedies till 184.

Of his numerous plays—130 bore his name in the last century of the Republic—only 21 have come down to us (of these several are incomplete). Of the 130, however, many were regarded by the Roman critics as not from Plautus's hand; indeed, Varro (in his treatise *Questiones Plautinæ*, cited by Gellius) limited the genuine comedies of the poet to 21. This list of 21 no ancient author names; but, since Varro's great authority would probably give currency in learned and other circles to the plays selected by him, it is quite possible that the surviving plays are, in fact, those named by Varro. Their titles are: (1) *Amphitruo*, (2)

Asinaria, (3) *Aulularia*, (4) *Bacchides*, (5) *Captivi*, (6) *Curculio*, (7) *Casina*, (8) *Cistellaria*, (9) *Epidiculus*, (10) *Mostellaria*, (11) *Menæchmi*, (12) *Miles Gloriosus*, (13) *Mercator*, (14) *Pseudolus*, (15) *Pœnulus*, (16) *Persa*, (17) *Rudens*, (18) *Stichus*, (19) *Trinummus*, (20) *Truculentus*, (21) *Vidularia*. As a comic writer Plautus enjoyed immense popularity among the Romans and held possession of the stage down to the time of Diocletian. The vivacity, the humor, and the rapid action of his plays, as well as his skill in constructing plots, his marvelous mastery of the Latin language, and his possession, when he chose to display it, of a narrative style comparable to that of Terence (q.v.) himself, commanded the admiration of the educated no less than of the unlettered Romans; while the fact that he was a national poet prepossessed his audiences in his favor. These same qualities have won him many admirers in modern times. Although he laid the Greek comic drama under heavy contributions and "adapted" the plots of Menander, Diphilus, and Philemon with all the license of a modern playwright, he always preserved the style and the character native to the Romans and reproduced the life and the intellectual tone of the people in a way that at once conciliated their sympathies. The admiration in which he was held by his contemporaries descended to Cicero and St. Jerome; while he has found imitators in Shakespeare, Molière, Dryden, Addison, and Lessing, and translators in most European countries. The best complete translation of his works into English is that by Thornton and Warner (5 vols, 1767-74), there is another by Riley (London, 1880), and a partial translation in the original metre, by Sugden (London, 1893). The first volume of a translation in the Loeb Classical Library, by P. Nixon, is soon to appear. Unfortunately the text of the extant plays is in such a very corrupt state that much yet remains to be done by the grammarian and the commentator before they can be read with full appreciation or comfort. Ritschl (q.v.) and his disciples gave the text its first exhaustive recension, on which are based the modern editions, such as those of Using (5 vols., Copenhagen, 1875-86), Goetz and Schoell (3 vols., Leipzig, 1893-96), F. Leo (2 vols., Berlin, 1896), W. M. Lindsay (2 vols., Oxford, 1904-05). Parts i-vii of a *Lexicon Plautinum*, by G. Lodge, carrying the work down to *hercle*, have appeared (Leipzig, 1901-14). Among the many good editions of separate plays, with commentary, may be mentioned those of Brix, Lorenz, Palmer, Fay, Goetz, Lindsay, Sonnenschein, Schoell, and Tyrrell. Consult W. Y. Sellar, *Roman Poets of the Republic* (3d ed., Oxford, 1889); Martin Schanz, *Geschichte der römischen Literatur*, vol. i, part i (3d ed., Munich, 1907); J. W. Duff, *A Literary History of Rome* (London, 1909). On the language of Plautus, consult W. M. Lindsay, *The Syntax of Plautus* (Oxford, 1907), and C. E. Bennett, *The Syntax of Early Latin*, vols. i-ii (Boston, 1910-14). On the metres of Plautus, see the "Introduction" to W. M. Lindsay's *editio maior* of the *Captivi* (London, 1900), and the authorities there cited. For a report on the whole array of writings on Plautus, from 1895 to 1912, whether in books or in the periodicals, consult W. M. Lindsay, "Jahresbericht über Plautus," in Burian's *Jahresbericht über die Fortschritte der klassischen Altertumswissenschaft* for 1906 and

1912 (Leipzig); for imitations and adaptations of Plautus, Karl von Reinhardtstoettner, *Plautus, Spätere Bearbeitungen plautinischer Lustspiele* (Leipzig, 1886).

PLAY, PIERRE GUILLAUME FRÉDÉRIC. See LE PLAY, P. G. F.

PLAYA, *plá'yá* (Sp., shore). The name given to mud plains formed by the deposition of silt in temporary lakes. In arid regions, such as the Great Basin, water collects in the valleys during the dry season, forming shallow lakes, which shrink or entirely disappear with the recurrence of dry weather. The sediment left by evaporation consists of finely divided rock debris which is impregnated with salt and becomes very hard under the sun's heat. The Black Rock Desert, in northwestern Utah, is a good example of a playa.

PLAYERS' CLUB, THE. A social club in New York City composed of men identified with American art, literature, painting, sculpture, architecture, the drama, etc., as well as prominent bankers and lawyers. Its creation was owing in a great measure to the liberality of the tragedian Edwin Booth (q.v.), to whom the club is indebted for its handsome club house at 16 Gramercy Park, New York City. It was purchased by Mr. Booth for \$75,000 and entirely remodeled. The work was completed in 1888, and on December 31 of that year it was formally presented, furnished and equipped for all the needs of club life. The club had been organized after the purchase of the building. Its affairs are managed by a board of nine directors, who must be identified with literature and the drama, and at least five of the body must be actors, dramatic writers, or theatrical managers.

PLAYFAIR, JOHN (1748-1819). A Scottish mathematician and geologist, born at Benvie. He was taught by his father until he was 14 years old, and he graduated from St. Andrews at 17. He entered the ministry in 1770, but devoted his leisure time to mathematical studies and in 1779 contributed to the *Transactions* of the Royal Society a paper "On the Arithmetic of Impossible Quantities." In 1785 he became professor of mathematics, jointly with Dr. Adam Ferguson, at Edinburgh. For many years he was general secretary of the Edinburgh Royal Society. In 1805 he exchanged his chair of mathematics for that of natural philosophy, and in 1807 he became a fellow of the Royal Society. A few years before his death Playfair traveled through France, Switzerland, and Italy to study geological and mineralogical features. From 1804 onward he was a frequent contributor to the *Edinburgh Review*, all his reviews being reprinted in the fourth volume of the collected edition of his works, edited by James G. Playfair (4 vols., 1822). He also contributed to the *Encyclopædia Britannica* and to the *Transactions* of the Royal Society of Edinburgh, edited Euclid's *Elements* (1795), and wrote *Outlines of Natural Philosophy* (2 vols., 1812-16) and *Illustrations of the Huttonian Theory of the Earth*.

PLAYFAIR, LYON, first BARON (1818-98). A British scientist and statesman, born at Chunar in Bengal. He was educated at St. Andrews and at Glasgow, where he took a course in chemistry. After studying under Liebig at Giessen, where he graduated Ph.D., he was honorary professor of chemistry at the Manchester Royal Institution in 1843-45. From

1858 to 1869 he held the chair of chemistry in Edinburgh University. Playfair sat in Parliament as a Liberal from 1868 to 1885, representing the Scottish universities and then until 1892 Leeds. He was appointed Postmaster-General in 1873 and became Privy Councillor; in 1892 was raised to the peerage and appointed a lord in waiting. He wrote: *Science in its Relation to Labor* (1853); *On Primary and Technical Education* (1870); *Science in Relation to the Public Weal* (1885); *Subjects of Social Welfare* (1889).

PLAYGROUNDS AND RECREATION CENTRES. Towards the close of the nineteenth century a great awakening to the needs and rights of children spread throughout Europe and America. Legislation prohibiting or regulating the employment of children in all forms of industry, compulsory education laws, and finally public provision for the children's hours of play were among the forms taken by this awakened interest in child welfare. In the early decades of the twentieth century in response to this need the playground movement was making rapid progress, a movement which included not only the provision of ample playgrounds but also of trained directors on these grounds who would supervise the children's play. The history of the play movement goes back to the rise of the kindergarten in 1826 and is but another application of Fröbel's teaching that the older people should live with the children and share their play. Later John Fiske pointed out the significance of the prolonged period of infancy in the human race and that the child, like other young animals, "does not play because it is young, but rather is allowed a period of infancy in order that it may play," for in play and not in work or in study every side of the child's nature, physical, emotional, and intellectual, is unified and developed.

The forerunner of the playground in the United States was the New England "common," where the boys met to play that peculiarly American game, baseball. It is not surprising, therefore, that the New England city of Boston led in the provision of children's playgrounds, which have been in existence there since 1882. New York was not far behind, portions of Central Park having for years been set aside as children's playgrounds, and in 1887 there was a general movement for the establishment of municipal playgrounds throughout the city and especially in the congested tenement-house district. In that year an Act was passed by the State Legislature permitting an annual expenditure of \$1,000,000 for the establishment of small parks. In May, 1888, the New York Society for Parks and Playgrounds for Children was incorporated under a special law giving the society unusual powers, including the appointment of special police. In 1894 the Tenement House Commission secured the adoption of a law which provides for at least two parks on the lower East Side "to be furnished in part as public playgrounds." The first of these plots was opened to the children in 1900. It was merely a bare piece of ground with no apparatus for children's games and no directors. Under such management it did very little good. The management of the second of these plots, known as Seward Park, was assumed by the Recreation League, an organization devoted to work of this character; apparatus was obtained and

directors secured to help the children in their games, the entire cost of equipping and operating the playground being paid by the league. The playground was opened to the public on June 3, 1899. From the start it was immensely popular with the children and an effectual proof of the feasibility and usefulness of such undertakings. In 1903 various other parks were opened as playgrounds.

Another branch of the work of furnishing playgrounds for the children of New York was undertaken in 1898. In that year the school boards of Manhattan and the Bronx appointed a committee for the management of summer playgrounds, appropriated \$15,000 for the work, and 20 playgrounds attached to public schools were opened. Apparatus for games and gymnastics were supplied the children, and a director was appointed to take charge of each playground. The daily attendance in the playgrounds averaged from 300 to 1000 children, and many had to be turned away.

The work of securing playgrounds in New York City is similar to the earlier attempts made in other of the larger cities to provide for the children's hours of play. According to Baker's *Municipal Year Book* (New York, 1902) 187 cities were operating public playgrounds in 1901. Contemporaneously a similar work has been going on in the principal European cities, with Glasgow in the lead. In 1907 the first of the Annual Play Congresses was held at Richmond, and the Playground and Recreation Society of America was organized, with permanent headquarters in New York City. It published a monthly magazine, *The Playground*, devoted exclusively to play interests. In 1914 the association published a recreation census which is summed up in the accompanying table.

Playground and recreation centres	Number of cities
Under paid supervision	342
Under volunteer supervision	22
Under no supervision	59
School playgrounds	149
	<hr/> 572
Work started:	
Recreation superintendents appointed	3
Playground associations and commissions organized	14
Committees appointed	8
Land secured	26
Money raised	8
Bond issues secured	2
Municipal appropriations and bond issues requested	3
	<hr/> 64

In addition, 31 cities reported that steps were being taken to arouse interest and that the movement was being agitated. In the 324 cities having paid supervision there were 2402 playgrounds and recreation centres, with 6318 play leaders, and a total expenditure of \$5,700,224 for the year. In addition to the sum just named bonds to the amount of \$2,358,000 were authorized by 20 cities.

Ownership and Management. In the early years public playgrounds were operated, if not owned, at private expense, but the work was rapidly assumed by municipalities and paid as part of the city budget. In 1913 the work was supported by public funds in 111 cities and partially so in 115 more. In some cities the management is assumed by city departments already in existence, as the park department or the school board; in other cities some private

organizations, as an improvement association or woman's club, attempted the administration of the work; in about 32 cities the work was deemed worthy of the formation of a new department.

Leadership. It has been the universal experience that to be effective the playground or recreation centre must have responsible and competent leadership. In fact, those playgrounds that have been maintained—there are at least 300 of them—without it have been so unsuccessful as to form a definite danger of "autovaccination against playgrounds," for a playground without a director is as useless as a school without a teacher and is dangerous. To meet the demand for trained leadership training classes were maintained in 1913 in 59 cities, 35 of these cities reported 2638 students. Of the 6318 play leaders employed, 3856 were women. This is a profession that is bound to attract young men and women who have a talent for leadership, knowledge of children and of out-of-door sports, and a desire for a very real kind of social service. Social as well as athletic gifts are essential for story-telling, and folk dances are favorite forms of recreation.

With these public playgrounds many special forms of activity have been associated, as is shown by the following statement, published in 1914 by the Playground and Recreation Association:

"Boy Scouts were in action at the recreation centres in 56 cities, Camp Fire Girls in 21 cities. There was organized debating in 15 cities, dramatics in 37, evening entertainments in 53, folk dancing in 132, gardening in 67; industrial work in 112 cities, instrumental music in 38; lectures, 36; libraries, 56; moving pictures, 35, pageants, 44, self-government, 52, singing, 84; social dancing, 42, story-telling, 143, summer camps, 27, swimming in 83, tramping in 74 and wading in 75 cities. Of these, it is interesting that the leading activities at recreation centres were story-telling in 143 cities, folk dancing in 132, and industrial work in 112 cities."

In addition to the regular playgrounds many cities are attempting to provide a safe place for the children's play by setting aside certain streets. During the summer of 1914 the plan was extensively tried in New York City. Nineteen "play zones" were set apart by order of the police commissioner for play between 3 and 6:30 P.M. In at least 10 other cities this plan was adopted in 1914.

The attempt to provide adequate play space for children is only a part of that larger recreation movement which aims to provide places for legitimate amusement for all the people. Various attempts to meet this need have been made. The use of the public-school plant outside of school hours as a recreation centre was widely recommended and frequently tried; 357 schoolhouses were reported as so used in 1914. Another form of open-air enjoyment has been provided by several American cities in the form of recreation piers. These are simply second stories to the ordinary shipping piers, provided with roofs. They are open day and evening, and music and dancing are enjoyed at certain hours. Chicago has a most elaborate system of recreation centres, located in small parks of from 5 to 10 acres, in the neighborhood of the working people. Besides the usual playground equipment these have people's clubhouses, with indoor

gymnasium, assembly hall, reading room, and restaurant.

Bibliography. Leland and Leland (eds.), *Playground Technique and Playcraft* (New York, 1910); E. B. Mero (ed.), *American Playgrounds* (2d ed., ib., 1910); C. A. Perry, *Wider Use of the School Plant* (ib., 1910); F. W. Blackmar, *Playgrounds and Parks* (Lawrence, Kans., 1910); "Public Recreation Facilities," in *American Academy of Political and Social Science, Annals*, vol. xxxv (Philadelphia, 1910); H. S. Curtis, *Education through Play* (New York, 1915); id., *Practical Conduct of Play* (ib., 1915); "Public Recreation," in *University of Wisconsin, Bulletin* No. 709 (Madison, 1915). The official organ of the Playground Association of America is *The Playground* (New York, 1907 et seq.).

PLAYING CARDS. See CARDS.

PLAYS. See DRAMA.

PLAZA, plá'sá, LEONIDAS (?-). An Ecuadorian politician. He was educated at the University of Quito and afterward entered politics. In 1901 he was elected to the presidency by the Liberal party. He pursued an anticlerical policy and encountered much opposition. The church was placed under state control, new orders were forbidden, and the church property was confiscated by the state. At the close of his administration he retired from politics, but upon the death of President Estrada, in 1911, Plaza offered his services to the government and was opposed by General Montero, who declared himself Dictator. After the disgraceful scenes of 1912, which resulted in the murder of Alfaro and Montero, Plaza was again chosen President. He at once took steps to reestablish the credit of the country by meeting the payments on the foreign debt and labored to secure important sanitary improvements. His administration was disturbed by revolutionary outbreaks.

PLEA (OF. *plait*, *plaid*, *play*, Fr. *plaid*, from Lat. *placitum*, decree, suit, plea, opinion, from *placere*, to please). In common-law pleading the defendant's answer or defense, consisting either of a denial of the facts alleged in the declaration or a confession that they are true and a statement of new facts by which their legal effect is avoided or of facts tending to defeat the action itself. A *plea* is distinguished from a *demurrer* in that the latter admits the facts alleged in the declaration, but denies their sufficiency in law to constitute a cause of action, whereas a *plea* raises only a question of fact in the manner indicated above.

Pleas are usually classed as peremptory and dilatory, according to their purpose and nature. A peremptory plea is one which brings in issue the merits of the controversy, either by denying absolutely the facts alleged in the declaration, when it is known as a plea in bar, or by confessing that the facts alleged by the plaintiff are true and setting forth new facts, which, if true, will defeat the alleged cause of action. The latter is known as a plea in confession and avoidance. A dilatory plea is one which attacks the action itself because of some defect in pleading or practice and therefore does not involve the merits of the case.

In equity pleading a special answer of the defendant attacking the particular action is also called a plea. It differs from a demurrer in equity in that it attacks something not apparent on the face of the bill, and it does not put in issue the merits of the action.

In England, where common-law pleading has been abolished, the Judicature Acts (q.v.) provide that the defendant's answer shall be known as the statement of defense, and this is analogous to a plea. The term "pleas of the crown" was formerly used to designate criminal prosecutions in the name of the sovereign. In the United States wherever code pleading prevails the term "plea" is no longer employed, a defense of fact being presented by an answer; but the divisions of pleas are often referred to by courts and lawyers as descriptive of the nature of a defense set forth by an answer. See PLEADING.

PLEADING (from *plead*, from OF., Fr. *plaider*, from OF. *plait*, *plaid*, *play*, Fr. *plaid*, *plea*). As a generic term, the written allegation of facts upon which a party to any legal proceeding founds his claim or demand or his answer or defense thereto. Used in a broader sense, the term signifies the system of legal rules and principles applicable to the written pleadings in a legal proceeding. Pleading is only one of the successive steps in a proceeding at law by which one party asserts or enforces his rights against another, all together being comprehended by the term "procedure" (q.v.).

Common-Law Pleading. Originally the pleadings in an action at common law were oral, as is evidenced by many peculiarities of the common-law procedure of a later date; but as early as the reign of Edward III we find that the pleadings were in writing and usually in Latin. Pleading at law, however, ultimately developed into a system of highly technical and formal rules requiring the greatest precision in their application and often by their very formality and rigidity defeating rather than aiding justice. Although remedial statutes were passed as early as the reign of Elizabeth, no attempt at a general reformation of the system was made until 4 Wm. IV, c. 42, in 1834. The system of common-law pleading was generally adopted in the United States, but later this was superseded in many of the States by various forms of statutory or code pleading.

The principles upon which any system of pleading is necessarily based will perhaps be best understood by referring briefly to the more essential elements of the common-law system. The primary object of the pleadings in an action at common law was to raise a single issue or dispute upon a point either of law or of fact. In the former case a question was raised for decision by the court, usually after argument upon the question of law involved and submission of briefs by opposing counsel. In the latter a question was raised for decision by the jury after hearing evidence tending on the one side to prove and on the other to disprove the fact in dispute. And upon the decision of the court or a verdict of the jury final judgment was entered determining the rights of the parties to the controversy.

The first step towards accomplishing the object of pleading after service of summons or mandate of the court upon the defendant was the filing of the declaration (known in modern practice as the complaint) in court. In the declaration the facts were required to be stated according to their legal effect only, and it was not permissible to set out the evidence on which the plaintiff relied. Owing to the tendency of the early lawyers to adopt fixed forms of statement and to their adherence to precedent, the declaration was required to conform to one of

a limited number of rigid forms, and if a plaintiff could not adapt the state of facts upon which he based his right to recover to one of these forms, he was without remedy. See FORMS OF ACTION.

After the plaintiff had filed his declaration it was then incumbent upon the defendant to make some statement of his defense; otherwise, after a certain period, judgment would be taken against him by default. If the defendant conceived that the declaration, if taken as true, did not show sufficient grounds to justify the plaintiff's recovery (or, as it was said, did not state a cause of action), he could submit the question of its sufficiency to the court as a matter of law by filing a demurrer to the declaration. (See DEMURRER.) If, however, the defendant wished to deny any of the allegations contained in the declaration, he might do so by filing a formal denial, his pleading in that case being known as a plea by way of traverse. An issue of fact was thus raised for decision by the jury.

It might happen, however, that the defendant, while admitting the truth of all the allegations in the declaration and admitting that it was legally sufficient, relied upon the existence of new or other facts sufficient to excuse him from the liability charged in the declaration, in which case his plea took the form of a confession and avoidance (q.v.). The plaintiff might then plead, setting up either a demurrer to the plea or a denial with the effect already described; or he in turn might plead by way of confession and avoidance and thus cast upon the defendant the burden of pleading again. In every case the pleadings were thus continued until a single issue of law or fact was raised, and the determination of that issue determined the rights of the parties to the litigation. Any plea of a defendant, such as has been described, setting up some matter of defense to the plaintiff's claim was known as a plea in bar or as a plea to the merits. It might happen, however, that the defendant wished to insist upon some matter which, though not a complete defense to the plaintiff's claim, was sufficient to show that the action was brought in an improper manner, as that the plaintiff was a married woman and had not joined her husband as plaintiff, or that the court had no jurisdiction, or that the defendant was not properly named. Such a plea was known as a plea in abeyance. The effect of a plea in abeyance, if successful, was to cause a dismissal of the plaintiff's action without prejudice to a second action if properly brought. If unsuccessful, the defendant was allowed to plead again to the merits.

The successive pleadings in an action, beginning with the plaintiff's pleading, were named the declaration, plea, replication, rejoinder, surrejoinder, rebutter, and surrebutter. Although theoretically possible, it was not usual for the proceedings to continue beyond the rebutter or surrebutter.

Upon the trial of an issue of fact, as the character of the issue was determined by the pleadings, it necessarily followed that the relevancy of all evidence offered at the trial was also primarily determined by the pleadings. Upon the entry of judgment all the pleadings in the case, together with the judgment constituting the judgment roll, were filed with the clerk of the court, thus constituting a complete permanent record of the case.

Owing to the highly technical and formal nature of the common-law system, the practice grew up of deciding the rights of litigants upon purely formal grounds, and judgment was frequently taken against a party upon demurrer because he had failed to state a perfectly valid claim or defense in the proper form. This was corrected to some extent by the Statute of 27 Eliz., c. 5, § 1, which provided that no advantage should be taken of defects of form, except by a special demurrer which should state specifically the formal defect objected to. The Statute 4 Anne, c. 16, § 1, was enacted for more effectively accomplishing this result, and 15 and 16 Vict., c. 76, §§ 50-52, abolished the special demurrer and required all defects of form to be taken advantage of by motion before trial. This is generally the modern practice. The Statute of Anne referred to allowed the defendant to plead several pleas to the same declaration, thus breaking down to some extent the principle of singleness of issue. Through laxity of practice also the defendant was allowed in his plea to make use of a general denial, known as the general issue, the effect of which in most actions was ultimately not only to deny all the essential allegations of the declaration, but to allow the defendant at the trial to prove many matters of affirmative defense. An attempt was made by Statute 4 Wm. IV, c. 42, to avoid the confusion and the frequently illogical results of this complicated system by authorizing the judges of the common-law courts to adopt certain rules modifying the common law of pleading as it then existed. These rules, known as the Hilary rules, were promulgated in 1834 and had for their principal object the narrowing of the general issue so as to make it conform more closely to a logical denial of the allegations in the complaint. These rules, however, did not succeed in accomplishing the desired result and seem only to have added to the confusion into which the subject had fallen. The law was substantially revised by 15 and 16 Vict., c. 76, and modern legislation has been enacted in all of the United States in which the common-law system has been modified.

Following are the more essential changes:

Matters of form are required to be taken advantage of by motion before trial, otherwise they are deemed to have been waived. Singleness of issue is not required, the defendant being allowed to use the general denial and to plead several matters by way of confession and avoidance. In many jurisdictions the number of successive pleadings is limited. Decisions upon demurrers are not necessarily final, the defendant being usually allowed to plead to the merits in case his demurrer is overruled.

Great freedom of amendment is allowed, a party being allowed to correct a defective pleading by amendment on application to the court, even at the trial of the action, if the rights of his opponent will not be prejudiced by the amendment. There are also many other changes, the general object being to make the system more simple and just in its application, and to avoid the determination of rights upon purely formal grounds.

Pleading at Criminal Law. At common law pleading in criminal actions was in its essentials substantially like pleading in civil actions, although much less elaborate.

The first pleading was called the indictment (q.v.). To this the accused might interpose

a demurrer, as in civil actions, and with like effect, except that if the demurrer were overruled he was allowed to plead to the indictment. All matters tending to show that the accused was not guilty of the offense charged might be shown under the oral plea *not guilty* or the plea *nolo contendere*, which was equivalent to guilty, except that it was not an admission by the defendant which could be used against him in evidence in a civil suit for the same act. After the plea no further pleading was necessary. The plea of abatement or previous conviction or acquittal of the same offense was required to be specifically pleaded as a plea by way of confession and avoidance; and to these the prosecution might demur with the same effect as a demurrer to a plea in abatement in a civil action.

Pleading at criminal law has been subjected to fewer statutory changes than pleading in civil actions. In some States less formality is required than at common law, and final judgment cannot be entered upon purely formal grounds. Formal defects may be cured by amendment, but there can be no amendment to matter of substance in an indictment, otherwise an amended indictment would not satisfy the requirement that the indictment must be found by the grand jury.

Equity Pleading. The system of pleading adopted in equity by the English Court of Chancery was derived partly from the common-law system and partly from the civil-law system as administered by the English ecclesiastical courts.

The important features of the civil-law system which characterize equity pleading were: (a) the absence of the denial or traverse, the rule being that all the allegations in a pleading were deemed to be denied unless expressly admitted by a subsequent pleading, which was exactly the converse of the common-law rule by which all the allegations in a pleading were deemed to be admitted unless expressly denied; and (b) the practice by which a party to the litigation could compel his opponent to testify, or give discovery, as it was called, in advance of argument or trial as to the matters alleged in the first party's pleading.

The plaintiff's pleading in an equity action is called the bill. In effect it is a petition addressed to the court asking that subpoena issue compelling the defendant to answer the bill. Formerly bills in equity were prepared with great formality and were usually composed of nine distinct parts. Of these, however, only four are important in modern practice, and two of these may be dispensed with. The essential parts are the statement of facts and the prayer for relief.

For the purpose of obtaining discovery the plaintiff might state in his bill at great length the evidence upon which he relied in support of his claim. This was known as the charging part of the bill. He might also ask specific questions founded upon the stating and charging parts of the bill, which he required the defendant to answer. This was known as the interrogatory part of the bill. After the appearance of the defendant, failing which a decree would be taken against him by default, he was required to answer the bill. The answer, which was required to be under oath, might set out at length any matters of defense, however numerous, relied upon by the defendant, but he was required to make discovery or give testi-

mony by answering fully and specifically the charging and interrogatory parts of the bill.

In early times other pleadings might follow the answer as at common law, but ultimately the answer came to be the last substantial pleading and was followed only by a formal plea always of the same tenor and used only to indicate that the parties were at issue.

In case it became necessary for the plaintiff to meet any of the allegations in the answer, this was accomplished by amendment. Upon the testimony taken before a master in chancery, and upon the answer, which was deemed to be not only a pleading, but in effect evidence introduced by the plaintiff, the decision and final decree of the Court of Chancery were based.

Equity pleading borrowed from the common law the use of the demurrer and the plea, with practically the same effect.

In the courts of equity of the United States, which under the Federal Constitution and statutes are distinct from the courts of common law, the same system of pleading has until recently been used as in the English Court of Chancery. It has, however, recently been thoroughly revised and modified by act of Congress. The pleading in the United States courts is, however, subject to modification by rules of court. The same system of equity pleading also obtains in those States in which the distinction between courts of equity and of law has been maintained.

Code Pleading. The supposed difficulty in satisfactorily modifying or reforming the common-law system by mere statutory revision or amendment has led in many of the United States to legislation abolishing the common-law system and creating or attempting to create a purely statutory form of pleading to be used in both law and equity actions. This step was first taken by the Legislature of New York, which adopted in 1848 the New York Code of Civil Procedure, which has served as a model for similar legislation in most of the other States adopting code procedure. A substantially statutory form of pleading and practice was also adopted in England by the Judicature Acts of 1873 and 1875. Under these codes discovery in equity actions is abolished. The pleader is allowed to plead the facts upon which he relies without formality. The pleadings are limited to two unless the defendant pleads a counterclaim, i.e., an independent action against the plaintiff, in which case the plaintiff may reply to it. The plaintiff's pleading is called a complaint, or in some States a petition, and in England a statement of claim. The defendant's pleading is called an answer, or in England a statement of defense. The defendant may demur to the plaintiff's complaint or to his reply to defendant's counterclaim, and the plaintiff may demur to defendant's answer or counterclaim, and if the demurrer is overruled, the litigant is generally allowed to plead to the merits as though no demurrer had been interposed. Formal defects can be taken advantage of only by motion before trial, and great freedom of amendment is allowed. While the codes of procedure which have in many of the States superseded the common-law system of pleading have, on the whole, done much to simplify the procedure preliminary to the trial of an issue, they have, on the other hand, introduced a new element of difficulty and in some States new and embarrassing complexities. As a code is a legisla-

tive act and therefore binding on the courts, the new system has a certain rigidity and inflexibility which has robbed the courts of the power to modify old rules to meet new conditions; while in some of the States, notoriously in New York, the minuteness with which the code regulates the details of procedure has resulted in a vast amount of litigation over merely formal matters of practice, with the result that practice under such a code has become uncertain, precarious, expensive, and subject to vexatious appeals and delays. The modern tendency is to substitute for codes of this character simple "Practice Acts," outlining the pleadings, etc., and leaving it to the courts to frame rules from time to time to govern the procedure in detail. See CIVIL LAW; CRIMINAL LAW; EQUITY; ETC.

Bibliography. Joseph Story, *Commentaries on Equity Pleadings* (10th ed., Boston, 1892); G. L. Phillips, *Exposition of the Principles of Pleadings under the Codes of Civil Procedure* (ib., 1896); J. H. Beale, *Treatise on Criminal Pleading and Practice* (ib., 1899); Edwin Baylies, *Rules of Pleading under the New York Code, and the Codes of Other States* (2d ed., Rochester, 1904); James Gould, *Treatise on the Principles of Pleading* (6th ed., by A. P. Will, Albany, 1909); W. M. Fletcher, *Equity Pleading and Practice* (Chicago, 1912); H. B. Bradbury (ed.), *Pleading and Practice Reports* (3 vols., New York, 1912-14); A. H. Robbins, *Treatise on American Advocacy* (2d ed., St. Louis, 1913); John Lewson, *Pleading Practice and Forms at Common Law* (3 vols., Chicago, 1914).

PLEASANTVILLE. A city in Atlantic Co., N. J., 5 miles northwest of Atlantic City, on the West Jersey and Seashore and the Atlantic City railroads (Map: New Jersey, C 5). It has a city hall, many fine residences, and good schools. Pleasantville is popular as a summer resort. Pop., 1900, 2182; 1910, 4390.

PLEASANTON, plēz'on-ton, ALFRED (1824-97). An American soldier, born in Washington, D. C. He graduated at West Point in 1844 and was assigned to the dragoons, with whom he served on the frontier and in Mexico. In 1855 he was promoted captain and in February, 1862, as major in the Second Cavalry, participated in the Peninsular campaign, his command covering the retreat of the Federal army to Yorktown (Aug. 18-19, 1862). In the Maryland campaign and in the battles of South Mountain, Antietam, Fredericksburg, and Chancellorsville he rendered distinguished service. He commanded the cavalry corps of the Army of the Potomac in the Pennsylvania campaign that terminated at Gettysburg (July 1-3, 1863), where he was brevetted colonel in the regular army. The next year he defeated General Price at Marais-des-Cygnes and drove the Confederates out of Missouri. He was brevetted major general in the regular army in 1865 and in 1866 was mustered out of the volunteer service as major general. Two years later he resigned from the army and after being collector of internal revenue and commissioner became, in 1871, president of the Terre Haute and Cincinnati Railroad. In 1888 he was placed on the retired list with the rank of colonel in the regular army.

PLEASURES OF HOPE. A poem by Thomas Campbell (1799), discussing the burning questions of the time, the French Revolution, the partition of Poland, and negro slavery.

PLEASURES OF MEMORY. A didactic

poem by Samuel Rogers (1792), the only want of which, Hazlitt remarked, is that of taste and genius.

PLEASURES OF THE IMAGINATION.

A poem by Mark Akenside (1744).

PLEBEIANS (OF. *plebeien*, Fr. *plébéien*, from Lat. *plebeius*, relating to the common people, from *plebs*, common people). The common people of ancient Rome; one of the two elements of which the Roman nation consisted. (See PATRICIAN.) Their origin as a separate class is to be traced partly to natural and partly to artificial causes. The foundation of Rome, perhaps as a frontier emporium of Latin traffic (according to Mommsen's suggestion), would bring about the place a number of inferior employees, clients (see PATRON), or hangers-on, of the enterprising commercial agriculturists who laid the primitive basis of the material and moral prosperity of the city. These hangers-on, inferior in birth and descent to the patricians, were the original plebeians or nonburgesses of Rome, whose numbers were constantly increased by the subjugation of the surrounding cities and states. Thus, tradition states that, on the capture of Alba Longa, while the most distinguished citizens of that town were received among the Roman patricians, the greater part of the inhabitants, likewise transferred to Rome, were kept in submission to the *populus* or patricians of Rome—in other words, swelled the ranks of the plebeians. Similar transfers of some of the inhabitants of conquered towns are assigned to the reign of Ancus Marcius. The order of plebeians, thus gradually formed, soon exceeded the patricians in numbers. The plebeians partly inhabited Rome and partly the adjoining country. Though citizens, they were neither comprehended in the three tribes, nor in the *curiae*, nor in the patrician *gentes*, and were therefore excluded from the comitia (q.v.), the senate, and all the civil and priestly offices of the state. (See CURIA, GENS.) They could not intermarry with the patricians.

The first step (according to traditionary belief) towards breaking down the barrier between the two classes was the admission, under Tarquinius Priscus, of some of the more considerable plebeian families into the three tribes. Servius Tullius divided the part of the city and the adjacent country which was inhabited by plebeians into regions or local tribes, assigning land to those plebeians who were yet without it. The plebeian tribes, with tribunes at their head, formed an organization similar to that of the patricians. The same King further extended the rights of the plebeians by dividing the whole body of citizens, patrician and plebeian, into five classes, according to their wealth, and forming a great national assembly called the *comitia centuriata* (see COMITIA), in which the plebeians met the patricians on a footing of equality, but the patricians continued to be alone eligible to the senate, the highest magistracy, and the priestly offices. These newly acquired privileges were lost in the reign of Tarquinius Superbus, but were restored on the establishment of the Republic (509 B.C.). Soon afterward the vacancies which had occurred in the senate during the reign of the last King were filled up by the admission of the most distinguished of the plebeian *equites*, and the plebeians acquired a variety of new privileges by the laws of Valerius Publicola. (See PUBLICOLA, PUBLIUS VALEBIUS.) The encroachments on those privileges by the patri-

cians began the long-continued struggle between the two orders, through which eventually the plebeians gained access to all the civil and religious offices, and acquired for their decrees (*plebiscita*) the force of law. An important part in this development was played by the famous Licinian Rogations (q.v.). Under the Hortensian law (286 B.C.) the two hostile classes were at last amalgamated in one general body of Roman citizens with equal rights. Henceforth the term *populus* is sometimes applied to the plebeians alone, sometimes to the whole body of citizens assembled in the *comitia centuriata* or *tributa*, and *plebs* is frequently used in a loose way for the multitude or populace, in opposition to the senatorial party. For a full discussion of views, ancient and modern, of the plebeians, consult G. W. Botsford, *The Roman Assemblies*, chap. ii (New York, 1909). See OPTIMATES; PATRICIAN; ROME, *History of Rome during the Earliest or Regal Period and From the Abolition of the Decemvirate to the Defeat of the Samnites*, etc., (1) Internal History.

PLEBISCITE (Fr. *plébiscite*, from Lat. *plebiscitum*, decree of the people, from *plebis*, gen. sing. of *plebs*, people + *scitum*, decree, from *scire*, to know). Originally, a decree enacted in the Roman *comitia tributa*, or assembly of the *plebs*. The erroneous identification of the Roman *plebs* with the modern *people* led to the employment of the term "plebiscite" to designate a decree of the people obtained by an appeal to universal suffrage. In a broad sense it is synonymous with the term "referendum" (q.v.). There is, however, a tendency to confine its use to appeals to the people in respect to questions of vital constitutional change, change of sovereignty, etc. Thus Louis Napoleon was made Emperor by a plebiscite.

PLECOP'TERA (Neo-Lat. nom. pl., from Gk. *πλέκειν*, *plekein*, to twist + *πτερόν*, *pteron*, wing) An order of insects comprising the stone flies. See STONE FLY.

PLECTAMBONITES (from Gk. *πλεκτός*, *plektos*, twisted + *ἄμβων*, *ambōn*, ridge). A genus of brachiopods with shells of semicircular outline, dorsal valve concave and ventral valve convex, with long, low hinge areas, and with the shell surface marked by fine regular radiating ribs. Two species are common and well-known index fossils. *Plectambonites sericeus*, the earlier characteristic Ordovician species, has a wider, less convex form, with the ribs all of about the same size; while *Plectambonites transversalis* of the Silurian has a rounder, more convex form with several delicate ribs inserted between larger ribs. Both these species are found occupying their relative positions in the Ordovician and Silurian rocks of North America, Europe, and Asia.

PLECTOGNATHI (Neo-Lat. nom. pl., from Gk. *πλεκτός*, *plektos*, twisted + *γνάθος*, *gnathos*, jaw). A group of bony fishes having the skeleton less perfectly ossified than in osseous fishes generally. It contains many highly aberrant forms, such as the globe-fishes. The maxillary bones are coossified with the premaxillaries. The skin is usually tough or well armed with bony plates or spines. The fins are small, the spinous dorsal fin sometimes and the ventral fins always wanting. These fishes are for the most part passive creatures and depend upon their armature for protection. The order contains three suborders, viz., Sclerodermi, Ostracodermi, and Gymnodontes, and includes such forms as the

trigger fishes, trunkfishes, puffers, etc. See Plate of PLECTOGNATH FISHES.

PLECTOSPONDYLI (Neo-Lat. nom. pl., from Gk. πλεκτός, *plektós*, twisted + σπόνδυλος, *spondylos*, σφόνδυλος, *sphondylos*, backbone). A group of teleost fishes, which consists entirely of fresh-water forms and includes about eight families, to which belong the majority of all the fresh-water fishes of the world. The essential character of the order, as defined by Jordan (*Fishes of North America*, Washington, 1896), lies in the modification of the anterior vertebrae, as in the Nematognathi, but the opercular bones are all present and the skin bears scales. It contains the three well-marked suborders, Evertognathi (the carps, minnows, suckers, etc.), Heterognathi (the tropical characinids, etc.), Gymnonoti (Gymnonotidae, etc.). Cf. OSTARIO-PHYSI.

PLECTRUM (Lat., from Gk. πλῆκτρον, *plēktron*, instrument for striking, from πλῆσσειν, *plēssein*, to strike). A small instrument made of ivory, tortoise shell, metal, or wood, used for plucking the strings of certain musical instruments, like the zither and mandolin. In olden times it was simply held between the fingers, but now it is generally provided with a ring to slip over the thumb.

PLEDGE (OF. *plege*, Fr. *pleige*, OIt. *pieggio*, pledge; of uncertain etymology, perhaps ultimately from Lat. *præbere*, *præhibere*, to offer, from *præ*, before + *habere*, to have). In English and American law, the delivery of a chattel by one person to another to be held by the latter as security for the performance of an obligation, usually the payment of a debt. The common-law pledge corresponds to the *pignus* of the civil law, although it cannot certainly be said that the common-law pledge was adopted from the civil law.

A pledge is distinguishable from a mortgage in that the relation of the pledgor and pledgee is that of bailor and bailee, the legal interest of the bailee being his right to possession of the pledge with power to sell it upon nonpayment of the debt, whereas the mortgagee acquires title to the property covered by the mortgage.

Any personal property actually in existence and capable of delivery into the possession of the pledgee may be pledged. Future property (i.e., property not yet in existence, as a ship yet to be built or cloth yet to be made) cannot be pledged. An agreement, however, for the pledging of future property creates a valid equitable lien which a court of equity will enforce whenever the property comes into existence. The so-called inchoate or potential property, which the common law regarded as present legal property, as crops planted but not grown, or the wool to be grown upon sheep actually in existence, might also be pledged.

The pledgee has a right to retain possession of the pledge only until the debt is paid or obligation performed. He is bound to exercise due and reasonable care in preserving and protecting the property pledged. When the debt or obligation becomes due he is entitled to sell the pledge and apply the proceeds to the payment of the debt, turning over the surplus, if any, to the pledgor. Before selling the property he is required to give fair and reasonable notice to the pledgor, and the sale should be made in such a manner as to secure the best price for the property. The usual method is by public auction at the place where property of the class pledged is usually

sold. Notice of the sale and any particular method of sale may be waived by the pledgor. Equity also exercised its jurisdiction to foreclose a pledge by directing a judicial sale of the property pledged, thus giving to the pledgee a remedy in addition to his common-law right of sale. An unauthorized sale or misappropriation of the pledge by the pledgee amounts to a conversion of the property, for which the pledgor may bring his action in trover or replevin. But it is not a violation of the pledge for the pledgee to transfer the pledged goods to another person along with his claim against the pledgor, nor does he at common law lose his right in the pledged chattel by making an unauthorized use of it, as by selling it or repledging it for a greater amount than his claim. In many States the law of pledge is regulated by statute.

Consult: R. H. Tyler, *Treatise on the Law of Usury, Pawns, and Pledges* (2d ed., Albany, 1882); William Colebrook, *The Law of Collateral Securities* (2d ed., Chicago, 1898); Walter Ashburner, *Concise Treatise on Mortgages* (2d ed., Boston, 1911); L. A. Jones, *Treatise on the Law of Collateral Securities and Pledges* (3d ed., Indianapolis, 1912); R. L. Henry, *Law of Liens and Pledges* (Chicago, 1914). See HYPOTHEC, HYPOTHECATION; MORTGAGE; PAWN-BROKING; PIGNUS.

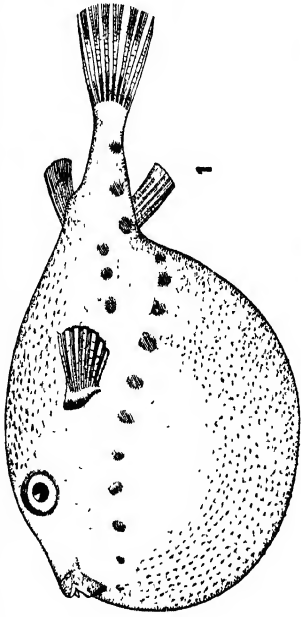
PLEH'VE, VIATCHESLAV KONSTANTINOVITCH (1846-1904). A Russian administrator. He studied law at Moscow University, entered the department of justice in 1867, became prosecuting attorney at St. Petersburg, and in 1881 director of the department of secret police in the Ministry of the Interior. He was made a Senator in 1884 and in 1894 Secretary of State for Finland. In this capacity he was a prime mover in the systematic attack begun by the government on the liberties of the Grand Duchy. (See FINLAND.) As Assistant Minister, Plehve took a very active part in lawmaking during the reign of Alexander III. After he became Minister of the Interior (1902) his repressive measures so aroused the revolutionary elements of Russia that he was assassinated in St. Petersburg, July 28, 1904. See RUSSIA.

PLEIAD, THE LOST. See LOST PLEIAD, THE; PLEIADES.

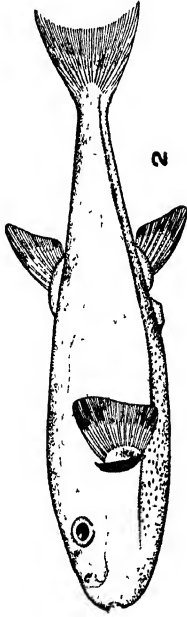
PLÉIADE, plá'yád' A name assumed by a group of scholarly French poets of the sixteenth century, seven in number, of whom Jean Daurat was master and Ronsard the best poet. The others were Belleau, Baif, Du Bellay, Jodelle, and Pontus de Thyard. Like seven Greek poets in the third century B.C. at Alexandria, they took the name *Pléiade*, from their number, on making their first declaration of principles, *La défense et illustration de la langue française*, by Du Bellay (1549). This aimed at a revival of classical studies, in the spirit of Petrarch, yet national and patriotic rather than erudite. Consult Louis Petit de Julleville, *Histoire de la langue et de la littérature française*, vol. iii (Paris, 1897), and essays by Ferdinand Brunetière in the *Revue des Deux Mondes* (ib., 1900 et seq.). See BAIF; BELLAY; BELLEAU; DAURAT; JODELLE; PONTUS DE THYARD; RONSARD.

PLEIADES (Lat., from Gk. Πλειάδες, Πληγάδες). In Greek legend the seven daughters of Atlas and Pleione, the daughter of Oceanus. According to some they committed suicide from grief, either at the death of their sisters, the Hyades (q.v.), or at the fate of their father, Atlas (q.v.); according to others, they were

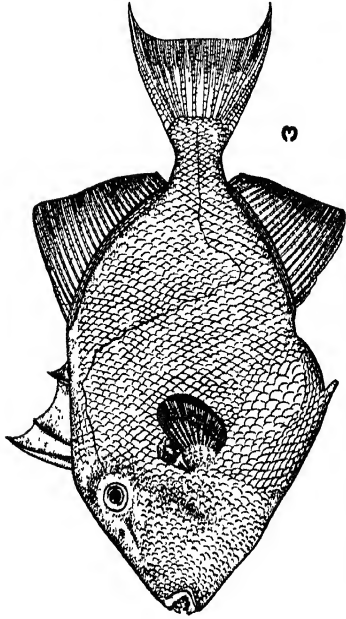
PLECTOGNATH FISHES



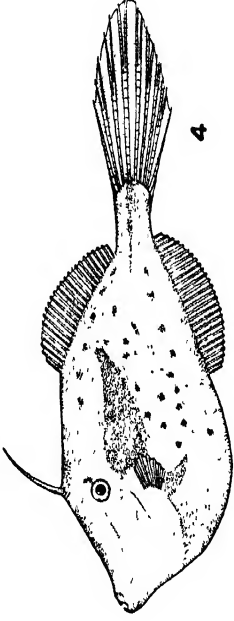
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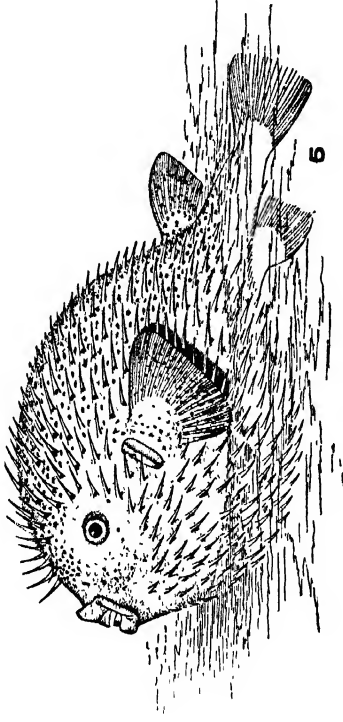
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1. A WEST INDIA GLOBEFISH (*Sphaeroides Spengleri*) puffed out.
2. SMOOTH PUFFER (*Lagocephalus laevigatus*).
3. TRIGGER-FISH (*Ballistes Carolinensis*).

4. FILEFISH (*Alutera scripta*).
5. PORCUPINE-FISH (*Diodon hystrix*) puffed out.
6. TRUNKFISH (*Lactophrys tricornis*).

companions of Artemis (Diana) and, being pursued by Orion (q.v.), were rescued from him by the gods by being translated to the sky. After their death or translation they were transformed into stars. As only six of these stars are easily visible to the naked eye, the story was told that one of them hid herself from shame that she alone had married a mortal, while her six sisters were the loves of different gods. (See LOST PLEIAD, THE, 1.) Their names are Electra, Maia, Taygete, Alcyone, Celano, Sterope, and Merope. To the Greeks the constellation was important, since with its heliacal rising in May navigation began and with its setting in November was supposed to close.

In astronomy the name designates a group of six stars on the shoulder of Taurus, the second sign of the Zodiac, forming, with the pole star and the twins, Castor and Pollux, the three angular points of a figure which is nearly an equilateral triangle. Many believe, from the uniform agreement that the Pleiades were seven in number, that the constellation at an early period contained seven stars, but that one has since disappeared—not a very uncommon occurrence. See LOST PLEIAD.

PLEIOCENE EPOCH. See PLEIOCENE EPOCH.

PLEIOSAURUS, or **PLIOSAURUS**. See PLEIOSAURUS.

PLEISTOCENE PERIOD (from Gk. *πλειστός*, *pleistos*, most, superlative of *πολύς*, *polys*, much, many + *καιρός*, *kairos*, new). The name introduced by Sir Charles Lyell to designate that period of geologic time which intervened between the end of the Tertiary and the beginning of the historic period. Within the last few years no other section of the earth's crust perhaps has received so much attention as the strata included under this name, and this is particularly true in America. The term Pleistocene is commonly used as synonymous with Quaternary, although some geologists tend to make two divisions of the Quaternary, viz., Pleistocene and recent. Other terms which are used are Post-Tertiary, Glacial period, and Ice age. One of the most marked features of the Pleistocene was its cold climate and the great development of continental glaciers which formed and spread over a large portion of the globe as a result of these climatic conditions. The faunal and floral characters of the Pleistocene were not sufficiently different from those of the Pliocene to have permitted making it a separate division of geologic time on this account, for in those regions which were not covered by the ice sheet we find that plant and animal life apparently continued on uninterruptedly from the Pliocene into the Pleistocene.

The glacial episode which marked the Pleistocene period is now fully described under GLACIAL PERIOD. Consult: T. C. Chamberlin, "Preliminary Paper on the Terminal Moraine of the Second Glacial Epoch," *United States Geological Survey, Third Annual Report* (Washington, 1883); Penck and Bruckner, *Die Alpen in Eiszeitalter* (Leipzig, 1901-09); Chamberlin and Salisbury, *Geology*, vol. iii (New York, 1907); H. L. Fairchild, "Pleistocene Geology of New York State," in *Bulletin of the Geological Society of America*, vol. xxiv (Washington, 1913). See GEOLOGY.

PLEISTOS, *plis'tōs* or *plās'tōs*. A river at Delphi (q.v.).

PLEKHANOV, *plā-kh'nof*, GEORGI VALENTINOVICH (1857-). Founder, leader, and

greatest theorist of the Russian Social Democratic party. He was born in the Government of Tambov. While a student in the Institute of Mining he took part in the famous political demonstration of 1876 near the Kazan Cathedral in St. Petersburg. Later he became a leading member of the revolutionary organization "Land and Liberty" and worked as an organizer among the laboring class of St. Petersburg and the Cossacks of the Don. Compelled to leave Russia in 1880, Plekhanov thereafter lived in Geneva and Paris, a political exile. In 1883 he organized the first group of what later became the powerful Social Democratic party of Russia. He edited a number of Socialist magazines, contributed numerous articles to the international Socialist press, and wrote some of the best-known works on Marxian Socialism, e.g., *The Monistic Interpretation of History; Anarchism and Socialism* (Am. ed. of Mrs. Eleanor M. Aveling's translation, 1908); *A Critical Study of Tchernitshevski; In the Course of Twoscore Years*. Plekhanov came to be regarded as one of the most versatile and brilliant writers of Russia. During the European War (1914 et seq.) Plekhanov stood as the leader of that faction of Russian Socialists who, instead of opposing the war, unreservedly took the side of the allies, believing that the cause of democracy was entirely dependent on their victory.

PLENER, *plā'nēr*, ERNST, BARON VON (1841-). An Austrian statesman, son of Ignaz, Knight von Plener. He was born at Eger and was educated at Vienna and Berlin. He served in the Diplomatic Corps (1865-73) and then entered the Imperial Diet, where he joined the Left and supported Andrassy's policy in the Balkans (1878). He succeeded Herbst as head of the German Liberals, both in Prague and in Vienna, and in 1888 was chosen leader of the party called United German Left. From 1893 to 1895, while Minister of Finance in Taaffe's cabinet, Plener reorganized the Austrian and Hungarian mint. In 1900, after five years at the head of the Court of Accounts, he entered the House of Lords. He became a member of the Permanent Court of Arbitration at The Hague. Plener wrote on English economic conditions, on Ferdinand Lassalle (1884), and on the Bohemian school and language question (1886).

PLENER, IGNAZ, KNIGHT VON (1810-1908). An Austrian statesman. He was born in Vienna, studied law, and entered the governmental service. In 1859 he was made Privy Councillor, a year afterward received the portfolio of Finance and revived the Bank Acts and the Ministry of Commerce before his resignation in 1865, and in 1867 entered the Liberal Centralist cabinet of Giskra as Minister of Commerce. This post he held until 1870. He was a member of the Lower House until 1873, when he was appointed to the House of Lords. Plener was an ardent defender of a personal-income tax, which he proposed in 1880. He was the father of Ernst, Baron von Plener.

PLENIPOTENTIARY. See DIPLOMATIC AGENTS; ENVOY; MINISTER.

PLEOCHROISM, *plē-ōk'rō-iz'm*. See DI CHROISM.

PLEROME (from Gk. *πλήρωμα*, *plērōma*, a filling). The central embryonic region in stems and roots. It develops into the stele, in which the vascular cylinder appears. See STEM.

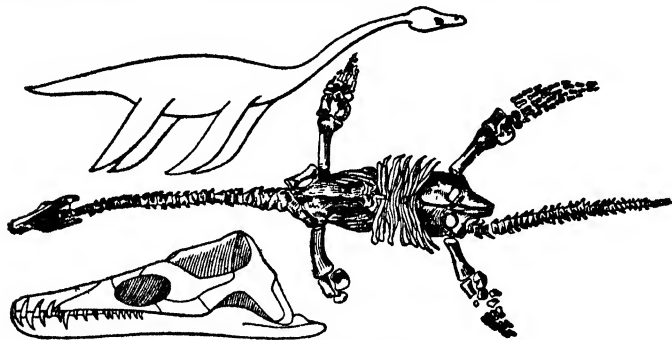
PLESHCHENIEV, *plēsh-chā'yéf*, ALEXEI

(1825-93). A Russian poet, born at Kostroma and educated at the University of St. Petersburg. His first volume of poetry, published in 1845, was well received. In 1849 he was accused of conspiracy against the Czar and sentenced to be shot, but Nicholas I commuted the death sentence to banishment to Orenburg, where Pleshtcheiev enlisted in the army as a private soldier. Having distinguished himself during the Crimean War, he was pardoned in 1857 and in 1872 made his home in St. Petersburg. From this time he produced much original poetry and translated poems of Heine, Byron, and Tennyson. In 1887 he published a complete collection of his verse.

PLESIOSAURUS (Neo-Lat., from Gk. πλεσιος, *plēsios*, near + σαυρος, *sauros*, lizard). An interesting fossil marine reptile of the order Sauropterygia, found in the Liassic rocks of Europe. The order Sauropterygia comprises a number of reptiles which began as small amphibians in the Trias and culminated in the Cretaceous as larger forms fully adapted to marine life. They had short, thick, lizard-like bodies, long flexible necks, small heads, and powerful tails. The early members had elon-

40 cervical vertebrae. The teeth are not so numerous as in *Nothosaurus* and are larger, recurved, and interlocking. The pelvic and pectoral limbs are remarkably similar to each other in form, and the phalanges of both were embedded in cartilage which filled out the form of the paddle just as in the ichthyosaurs. These creatures varied from 10 to 20 feet in length, and they must have been abundant in the Liassic seas of England and Germany, where finely preserved skeletons of them have been obtained. Twenty-five species are known in the Lias of England alone. *Plesiosaurus* is a gigantic plesiosaur with a skull nearly 5 feet long and teeth 12 inches long, found in the English Upper Jurassic, and it is possibly a synthetic type between the ichthyosaurs and the plesiosaurs. American representatives of the plesiosaurs have been found in the Upper Jurassic beds of Alabama, New Jersey, Kansas, and Wyoming and have been described under the names *Cimoliosaurus*, *Megalosaurus*, *Elasmosaurus*, *Dolichorhynchops*, etc. A skeleton of Cope's *Elasmosaurus* from the Upper Cretaceous of Fort Wallace, Kans., lacking the head, measures 42 feet in length, of which the neck, with

72 vertebrae, occupies 22 feet. Some of the American examples have afforded interesting evidence of the feeding habits of these creatures. Stones of various sizes, from ¼ inch to 4 inches in diameter, were found in the position of the stomach and are supposed to have been swallowed as aids to digestion. One specimen had 125 such stones in its stomach. Plesiosaurs, as Cuvier expressed it, combine the paddles of a whale, the head of a lizard, and a long neck like the body of a serpent. They were powerful animals, swimming freely about the shallow seas



THE PLESIOSAURUS.

Outline of *Plesiosaurus dolichodeirus*, fossilized skeleton, and enlarged view of skull.

gated limbs adapted for crawling on land, which became shortened and assumed paddle-like form in the later genera, but which never so thoroughly degenerated to finlike organs as did those of the ichthyosaurs (q.v.) Two families are recognized: *Nothosauridae*, comprising small, more primitive forms, having five-toed feet with the normal number of phalanges, *Plesiosauridae*, comprising large animals with paddle-shaped limbs and the digits lengthened by an increased number of phalanges, and with the pectoral girdle enlarged to form a protective covering for the thorax. *Lariosaurus* and *Nothosaurus* from the Triassic of Europe are the important genera of the first family, and *Plesiosaurus* from the Liassic of Europe and *Cimoliosaurus* from the Cretaceous of America and New Zealand are representative of the second family.

The genus *Nothosaurus*, which attained a length of about 10 feet, had a long flattened skull and small eyes near the middle of the head. The teeth were numerous, small and regular in the posterior portion of the jaws, but large and recurved, like spreading tusks, in the front. *Plesiosaurus* had a proportionately smaller head of triangular form and a neck which in some species exceeded in length the remainder of the body and which was supported in the different species by from 25 to

of Jurassic and Cretaceous times and feeding upon the fish and smaller marine reptiles, for preying upon which their long necks and numerous spreading teeth admirably fitted them.

Consult: Von Zittel and Eastman, *Textbook of Paleontology*, vol. ii (New York, 1902); S. W. Williston, "A New Plesiosaur, etc.," and "An Interesting Food Habit of the Plesiosaurs," in *Transactions of the Kansas Academy of Science*, vols. xii, xiii (Topeka, 1890, 1893); id., "North American Plesiosaurs, part i," in *Field Columbian Museum, Publication 73* (Chicago, 1903); F. A. Lucas, *New Plesiosaur* (Washington, 1903).

PLESSIS, Du, du plé'sé' See RICHELIEU.

PLESSIS, plé'sé', JOSEPH OCTAVE (1763-1825). A Roman Catholic prelate of Canada, born at Montreal. He entered the priesthood in 1786, was appointed coadjutor to Monsignor Denauet, Bishop of Quebec, and succeeded to the bishopric in 1806. He obtained a royal charter for Nicolet College, which he enlarged and endowed, and founded the Catholic primary schools of Quebec. The British government did not immediately recognize him as Bishop, claiming the right of nomination to the office which the French government had formerly possessed. The Bishop successfully maintained his position, and in 1818 he was summoned to the Executive

Council of Canada by his episcopal title. Although in 1818 Quebec was made an archbishopric, the government never recognized it as such. Plessis enthusiastically supported the British crown and the Imperial relation. Consult his *Life* by Ferland (Quebec, 1864), and Kingsford, *History of Canada* (Toronto, 1888-98).

PLETHON, GREGORIUS or GEMISTUS. See GEMISTUS, GEORGE.

PLEURA (Neo-Lat., from Gk. πλεῦρά, rib, side). The name of the serous membrane investing the lung, which, after inclosing the whole organ except at its root, where the great vessels enter it, is reflected upon the inner surface of the chest. That portion of the pleura which is in contact with the surface of the lung is called the pleura pulmonalis, or visceral layer, while that which lines the interior of the chest is called the pleura costalis, or parietal layer, the two layers being normally everywhere in contact, moving upon each other freely during respiration, a lubricating fluid being secreted for this purpose. A space intervening between these two layers exists only under pathological conditions, when it may be occupied either by air or fluid, and is called the cavity of the pleura. (See PLEURISY.) Each pleura is a closed sac and quite independent of the other. The central interspace between the right and left pleurae is termed the mediastinum (q.v.) and contains all the viscera of the thorax excepting the lungs. The inner surface of each pleura is smooth, glistening, and moistened by a serous fluid; the outer surface is closely adherent to the surface of the lung, to the roots of the pulmonary vessels as they enter the lung, to the upper surface of the diaphragm, and to the walls of the chest. The lobes of the lungs are separated from one another by involutions of the visceral layer. The use of these serous sacs is much the same as that of the peritoneum (q.v.); each pleura retains the lung and to a certain extent the greater vessels in position, while it facilitates, within certain limits, the movements essential to respiration.

PLEURACANTHUS (Neo-Lat., from Gk. πλεῦρον, *pleuron*, rib + ἀκανθα, *akantha*, spine), or DIPLODUS. A fossil sharklike fish found in the Carboniferous and Permian rocks of North America, Europe, and Australia. The body was long and tapering, with a diphyccercal caudal fin. The dorsal fin extended almost the entire length of the back and was separated from the upper lobe of the caudal fin by only a slight notch. On the head was a long, posteriorly directed strong spine, hollow and armed with longitudinal rows of barbs. The pectoral and pelvic fins were large, and there were two small anal fins. Several complete skeletons have been found in the European Carboniferous rocks.

PLEURISY (Fr. *pleurésie*, from Lat. *pleuritis*, *pleuritis*, from Gk. πλεῦρις, *pleuritis*, pleurisy, from πλεῦρά, *pleura*, rib). An inflammation of the pleura (q.v.).

Pleurisy may be acute or chronic, primary or secondary, plastic (dry) or characterized by an effusion of fluid. It occurs after exposure to cold; as a secondary process in acute diseases of the lung, as pneumonia, which is always accompanied by a greater or less amount of dry pleurisy; as a result of injuries; or as an effect of rheumatism. The most frequent cause, however, is tuberculosis; recurrent attacks of pleur-

isy are almost always tuberculous in character.

In the dry or plastic form of pleurisy the affected area of the membrane becomes congested and opaque, roughened, and covered with lymph. The process may be arrested at this point, the exudate be absorbed, and complete recovery take place; or the plastic exudate may become organized and produce permanent adhesions between the two pleural layers. These adhesions are in the form of patches or bands and in proportion to their extent limit the movements of the lungs.

In pleurisy with effusion there is thrown out a varying amount of serofibrinous fluid, pale yellowish in color, or brownish at times from extravasated blood. In composition this closely resembles the serum of the blood. The effusion may be so small as to cause no symptoms and escape notice. When the amount is considerable the lung is compressed, the heart and other organs are displaced, and respiration and circulation seriously interfered with. Small quantities of fluid are readily absorbed, but large effusions may persist for months unless reduced by surgical means. In some cases the effusion is limited to the diaphragmatic portion of the pleura (diaphragmatic pleurisy); in others only the portion between the lobes of the lung is involved (interlobular pleurisy). A hemorrhagic effusion sometimes occurs during the course of certain malignant fevers and in pernicious anæmia, scurvy, and cancer.

A pleuritic exudate may become infected by pus-producing bacteria, which soon convert the fluid into a purulent material. This condition is called empyema and is a grave complication. The pleural cavity is converted into what is virtually a large abscess, which may evacuate itself by burrowing through the lung substance to a bronchial tube and being coughed up; or it may penetrate the chest wall or make its way through the diaphragm into the peritoneal cavity and set up a general peritonitis. The affection is more common and less likely to be fatal in children than in adults.

The most prominent symptoms of pleurisy are chills, fever, stitch in the side, and a dry, unproductive cough. The pain is at first severe and is exaggerated with every movement of the body, by coughing, sneezing, etc. Respiration is difficult and shallow, and the patient lies upon his back or on the healthy side. After effusion has taken place pain is less marked, and the patient lies on the affected side in order to give the healthy lung full play. In addition to these symptoms general malaise and weakness exist, accompanied by loss of appetite and a quick pulse. Empyema is marked by irregular temperature, chills, and sweats.

The physical signs of dry pleurisy are impaired motion on the affected side and a friction sound caused by the rubbing together of the inflamed surfaces. When the effusion has occurred this sound disappears, there is a loss of pulmonary resonance, and dullness or flatness on percussion over the area occupied by the effusion. The side involved is larger than the other, the intercostal spaces are obliterated or bulge. The heart may be displaced upward or to one side.

A serofibrinous pleurisy may persist for months, and the lung from the long-continued pressure may become permanently contracted, so that when the fluid is absorbed or drawn off it fails to return to its normal dimensions and to

fill the whole cavity. Adhesions may help to produce this condition.

The treatment of dry pleurisy comprises rest in bed, saline catharsis, and relief of pain by the administration of sedatives or by counter-irritation in the form of a mustard plaster or the application of the electrocautery. Strapping the chest with long strips of adhesive plaster gives comfort by limiting respiratory movements. Pleurisy with effusion requires a somewhat different plan of treatment. To favor absorption of the exudate, the diet is made light and dry, and daily concentrated doses of Epsom salts are given to promote elimination. The skin and kidneys are also kept active with diaphoretic and diuretic medicines. Mild counter-irritation with mustard or iodine is useful in the later stages. When the effusion is large and resists all ordinary methods of treatment, aspiration of the fluid or part of it is practiced. This is accomplished by puncturing the chest wall with a hollow needle attached to a suction pump. The operation is simple and not painful and is sometimes done merely to determine the nature of the exudate. The fluid is withdrawn slowly, the amount depending on the size of the effusion. In some cases a quart or more can be abstracted with safety. Frequently the withdrawal of a small amount will be followed by spontaneous absorption of the remainder. Treatment by autoserotherapy consists in withdrawing a hypodermic syringe of the exudate and injecting it immediately beneath the skin. Purulent pleurisy (empyema) is treated by making an incision into the chest wall and allowing the pus to escape, washing out the cavity and draining it. This operation dates from the time of Hippocrates and is not a serious procedure. The cavity is gradually filled by the expansion of the lung and the falling in of the chest wall. Sometimes it is necessary to remove portions of one or more ribs. Expansion of the lung is promoted by systematic breathing exercises.

PLEURISY ROOT. A milkweed. See BUTTERFLY WEED.

PLEU'ROCOC'CUS. See ALGÆ.

PLEU'RODYN'IA (Neo-Lat., from Gk. πλεῦρά, rib + ὀδύνη, *odynē*, pain). A rheumatic affection of the intercostal muscles on one side, characterized by acute pain in the side upon taking a full breath or coughing and by tenderness on pressure. The respiratory movements are restricted as much as possible on account of the pain. The disease is difficult to distinguish from intercostal neuralgia, in which disease, however, the pain is usually more limited and paroxysmal and there are tender points along the course of the nerves. It may also be mistaken for dry pleurisy (q.v.). The pain may be completely relieved by strapping the chest with strips of adhesive plaster. Mild counterirritation and stimulating liniments are very often useful. The general treatment is that of rheumatism (q.v.).

PLEU'RONEC'TIDÆ. See FLATFISH; FLOUNDER.

PLEU'ROPNEUMO'NIA (Neo-Lat., from Gk. πλευρόν, *pleuron*, side + πνευμονία, *pneumonia*, pneumonia), LUNG PLAGUE, LUNG FEVER, PERIPNEUMONIE (Fr.), LUNGENSEUCHE (Ger.). A malignant contagious disease of cattle, characterized by an inflammatory process accompanied by exudation on the pleura and in the lungs. The disease has been recognized in Eu-

rope since the close of the eighteenth century. Domestic cattle, the buffalo, and the yak are most susceptible to it. Goats, pigs, horses, and carnivora are very resistant, and man is immune. It occurs at present in Europe, Asia, Africa, and Australia. It has been eradicated from Great Britain, the last outbreaks having occurred in 1898. The disease was introduced into the United States in 1843 and was finally eradicated through the efforts of the Bureau of Animal Industry in 1892. Consult: V. T. Atkinson and others, *Special Report on Diseases of Cattle*, published by the Bureau of Animal Industry (rev. ed., Washington, 1912); Huttyra and Marek, *Special Pathology and Therapeutics of the Diseases of Domestic Animals*, vol. i (Chicago, 1912); E. W. Hoare, *A System of Veterinary Medicine*, vol. i. (ib., 1913).

PLEU'ROTOMA'RIA (Neo-Lat. nom. pl., from Gk. πλεῦρόν, *pleuron*, rib + τομάριον, *tomarion*, dim. of τόμος, *tomos*, cut, slice, from τέμνειν, *temnein*, to cut). The typical genus of Pleurotomaridæ, a family of scutibranchiate gastropods. While quite rare at the present time, this genus was abundantly represented in the seas of the Paleozoic, Mesozoic, and Cenozoic eras. Its ancestral form is apparently the genus *Raphistoma*, a small shell of the early Ordovician, with low spire and sharply angular whorls. *Pleurotomaria* itself, with elevated spire and prominent slit band, made its appearance in the Silurian, and with a great variety of forms and allied genera it attained its maximum in the seas of Mesozoic time, since when it has been gradually declining to the present time. This large genus, embracing several hundred species, is split up into a number of subgenera. One of the most important allies of *Pleurotomaria* is the Paleozoic genus *Murchisonia* (q.v.).

PLEVNA, plév'nà, or **PLEVEN**, plá'ven. A town of Bulgaria, situated on a tributary of the Danube and on the Sofia-Varna Railway, about 85 miles northeast of Sofia (Map: Balkan Peninsula, E 3). The town has a considerable trade in cattle and wine. It is connected by a branch railway, 25 miles long, with the port of Nikopol on the Danube. Pop., 1910, 23,049.

Plevna is famous for the rôle which it played in the Russo-Turkish War of 1877. Garrisoned only by a small Turkish force at the beginning of the war, the place became, after the taking of Nikopol by the Russians (July 16, 1877), the centre of operations in the western part of the theatre of war in Bulgaria. Just as the Russians were preparing to march towards Sofia Osman Pasha arrived with a part of his army at Plevna. The Turkish forces at that point now amounted to 17,000 men with 58 guns, and the Russians dared not advance leaving this unexpected enemy in their rear. On July 20, 1877, an assault by a comparatively small force of Russians was repulsed, their loss being about 2800 men. The result of the first assault revealed to the Russians the strength of the Turkish forces at Plevna, and accordingly the Russian forces were increased to about 32,000 men with 176 guns. The second attack, on July 30, led by General Krüdener, was also unsuccessful, and the Russians lost over 7000 men. The besieging army was augmented by about 35,000 Rumanians, while the Turkish forces were also increased to about 38,000 men with 70 guns. On September 7 the bombardment was resumed, and in a desperate assault

on September 11 General Skobelev captured three trenches, but was compelled to abandon them on the following day. The Russians and Rumanians lost nearly 16,000 men between September 7 and 11, and it was then decided to invest the town by a large army and compel its surrender by cutting off its supplies. These operations were successfully carried out under the direction of Totleben, and the besieged army, which had by that time been increased to about 45,000 men, soon began to suffer from lack of supplies and ammunition. Osman Pasha, finally decided to break through the Russian chain and accordingly crossed the Vid with his entire army on the night of December 9-10 and after an unsuccessful attack was thrown back towards the river, but, unable to cross the stream, surrendered unconditionally after a hard fight, in which he himself was wounded. The Russians took 40,000 prisoners and 77 guns. The total loss of the besieging army in killed and wounded was about 40,000 men.

Consult Osman Pasha, *Défense de Plevna, d'après les documents réunis par Mouzaffer Pasha et Taalat Bey* (Paris, 1889), and W. V. Herbert, *The Defense of Plevna* (London, 1896).

PLEXIMETER. See PERCUSSION.

PLEXUS. See NERVOUS SYSTEM AND BRAIN.

PLEYEL, plî'el, IGNAZ (1757-1831). An Austrian composer, born in Ruppersthal, near Vienna. He studied music under Wanhall and Haydn and made in early life an extensive tour of Italy to hear the works of the best composers. In 1789 he was made kapellmeister of the Strassburg Cathedral and there composed most of the works on which his popularity rests. In the winter of 1791-92 he was engaged as the conductor of the London Professional Concerts. He returned to Strassburg and subsequently went to Paris (1795) and after a successful career in that city as a publisher of music and pianoforte manufacturer retired to an estate which he had purchased near the capital. His compositions, consisting of 29 symphonies, numerous quartettes, concertantes, and sonatas, are full of agreeable melodies which caught the popular fancy. But the complete lack of all serious qualities caused them soon to fall into oblivion. He died on his own estate, near Paris.

PLIMER, plî'mër, ANDREW (1763-1837). An English miniature painter. He was born at Wellington (Shropshire) and was the servant and then the pupil of Richard Cosway (q.v.) whose style he imitated and whom he succeeded as a favorite miniaturist of the court. He is excellently represented by 26 works in the Morgan collection, Metropolitan Museum, New York.

His elder brother, **NATHANIEL** (1757-1822), who was born at Wellington and was for a time assistant to Henry Bone the enameler, also painted miniatures in the same style as, but inferior to, those of Andrew. The Morgan collection contains good specimens of his work also. Consult G. C. Williamson, *Andrew and Nathaniel Plimer* (London, 1903).

PLIMSOLL, plîm'sol, SAMUEL (1824-98). An English reformer, known as The Sailor's Friend. He was born and educated in Bristol. As a coal dealer in London he began to take an interest in the carrying trade and to remark upon the risks to sailors in being shipped upon overladen or unseaworthy, yet largely insured, vessels. As a member of Parliament (for Derby) and by his book *Our Seamen* (1873), he

led in the discussion of shipping abuses. In 1875 Plimsoll caused an exciting scene in the House of Commons by his violent attack upon ship-owners, some of whom were present. Eventually he secured the enactment of the Merchant Shipping Act of 1876, which remedied the sailors' grievances. His *Cattle Ships* (1890) was written to gain reform. See also **LOAD-LINE MARKS OF VESSELS**.

PLIMSOLL MARK. See **LOAD-LINE MARKS OF VESSELS**.

PLINLIMMON. See **PLYNLIMMON**.

PLINTH (Lat. *plinthus*, from Gk. *πλινθος*, *plinthos*, brick, tile, plinth). The square member at the bottom of the base of a column, also the plain projecting band forming a base of a wall. See **ORDERS OF ARCHITECTURE**.

PLINY THE ELDER, GAIUS PLINIUS SECUNDUS (23-79 A.D.). The author of the celebrated *Historia Naturalis*. He was born in the north of Italy, probably at Novum Comum (Como). Whether it was his birthplace or not, Novum Comum was certainly his family's place of residence, since he had estates in its neighborhood. While still young he was sent to Rome, where his ample means and high connections secured him the best education. At the age of 23 he entered the army and served in Germany as commander of a troop of cavalry under Lucius Pomponius Secundus, of whom in later life he wrote a memoir. He traveled over nearly all the frontier of that extensive province, visited the Chauci and the sources of the Danube, composed during the intervals of military duty his treatise *De Iaculatione Equestri*, and commenced a history (afterward completed in 20 books) of the Germanic wars. On his return to Rome in 52, he entered on the study of jurisprudence, but his pleading was unsuccessful, and accordingly he retired to his native place. There he wrote his *Studiosus*, a treatise in three books on the training of a young orator from the nursery to his entrance on public life, apparently intended to guide the education of his nephew, Pliny the Younger (q.v.); also his grammatical work, *Dubius Sermo*, in eight books. Shortly before Nero's death we find him a procurator in Spain, where in 71 he heard of his brother-in-law's decease and of his being intrusted with the guardianship of his nephew, Pliny the Younger, whom he adopted on his return to Rome, before 73. Vespasian, the reigning Emperor, whom he had known while in Germany, received him as one of his most intimate friends, and it was at this period that he completed, in 31 books, and brought down to his own time the Roman history of Aufidius Bassus. He collected an immense mass of materials, from which he compiled his great *Historia Naturalis*, published about 77. No fewer than 160 *volumina* of notes were found at his death, two years afterward. At the time of the great eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii, in 79, he was stationed off Misenum in command of the Roman fleet. Eager to examine the phenomenon more closely, he landed at Stabiae, where he was suffocated by the vapors caused by the eruption. He was, as his nephew tells us, corpulent and asthmatic, and so sank the more readily. None of his attendants shared his fate. The story of his death is described in two letters of his nephew, Pliny the Younger, to Tacitus, written many years after the event (*Epistles*, vi, 16 and 20).

fill the whole cavity. Adhesions may help to produce this condition.

The treatment of dry pleurisy comprises rest in bed, saline catharsis, and relief of pain by the administration of sedatives or by counter-irritation in the form of a mustard plaster or the application of the electrocautery. Strapping the chest with long strips of adhesive plaster gives comfort by limiting respiratory movements. Pleurisy with effusion requires a somewhat different plan of treatment. To favor absorption of the exudate, the diet is made light and dry, and daily concentrated doses of Epsom salts are given to promote elimination. The skin and kidneys are also kept active with diaphoretic and diuretic medicines. Mild counter-irritation with mustard or iodine is useful in the later stages. When the effusion is large and resists all ordinary methods of treatment, aspiration of the fluid or part of it is practiced. This is accomplished by puncturing the chest wall with a hollow needle attached to a suction pump. The operation is simple and not painful and is sometimes done merely to determine the nature of the exudate. The fluid is withdrawn slowly, the amount depending on the size of the effusion. In some cases a quart or more can be abstracted with safety. Frequently the withdrawal of a small amount will be followed by spontaneous absorption of the remainder. Treatment by autoserotherapy consists in withdrawing a hypodermic syringe of the exudate and injecting it immediately beneath the skin. Purulent pleurisy (empyema) is treated by making an incision into the chest wall and allowing the pus to escape, washing out the cavity and draining it. This operation dates from the time of Hippocrates and is not a serious procedure. The cavity is gradually filled by the expansion of the lung and the falling in of the chest wall. Sometimes it is necessary to remove portions of one or more ribs. Expansion of the lung is promoted by systematic breathing exercises.

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PLEU'RONEC'TIDÆ. See FLATFISH; FLOUNDER.

PLEU'ROPNEUMO'NIA (Neo-Lat., from Gk. πλευρόν, *pleuron*, side + πνευμονία, *pneumonia*, pneumonia), LUNG PLAGUE, LUNG FEVER, PEPHNEUMONIE (Fr.), LUNGENSEUCHE (Ger.). A malignant contagious disease of cattle, characterized by an inflammatory process accompanied by exudation on the pleura and in the lungs. The disease has been recognized in Eu-

rope since the close of the eighteenth century. Domestic cattle, the buffalo, and the yak are most susceptible to it. Goats, pigs, horses, and carnivora are very resistant, and man is immune. It occurs at present in Europe, Asia, Africa, and Australia. It has been eradicated from Great Britain, the last outbreaks having occurred in 1898. The disease was introduced into the United States in 1843 and was finally eradicated through the efforts of the Bureau of Animal Industry in 1892. Consult: V. T. Atkinson and others, *Special Report on Diseases of Cattle*, published by the Bureau of Animal Industry (rev. ed., Washington, 1912); Huttyra and Marek, *Special Pathology and Therapeutics of the Diseases of Domestic Animals*, vol. i (Chicago, 1912); E. W. Hoare, *A System of Veterinary Medicine*, vol. i. (ib., 1913).

PLEU'ROTOMA'RIA (Neo-Lat. nom. pl., from Gk. πλευρόν, *pleuron*, rib + τομάριον, *tomarion*, dim. of τόμος, *tomos*, cut, slice, from τέμνειν, *temnein*, to cut). The typical genus of Pleurotomaridæ, a family of scutibranchiate gastropods. While quite rare at the present time, this genus was abundantly represented in the seas of the Paleozoic, Mesozoic, and Cenozoic eras. Its ancestral form is apparently the genus *Raphistoma*, a small shell of the early Ordovician, with low spire and sharply angular whorls. *Pleurotomaria* itself, with elevated spire and prominent slit band, made its appearance in the Silurian, and with a great variety of forms and allied genera it attained its maximum in the seas of Mesozoic time, since when it has been gradually declining to the present time. This large genus, embracing several hundred species, is split up into a number of subgenera. One of the most important allies of *Pleurotomaria* is the Paleozoic genus *Murchisonia* (q.v.).

PLEVNA, plév'ná, or **PLEVEN**, plá'ven. A town of Bulgaria, situated on a tributary of the Danube and on the Sofia-Varna Railway, about 85 miles northeast of Sofia (Map: Balkan Peninsula, E 3). The town has a considerable trade in cattle and wine. It is connected by a branch railway, 25 miles long, with the port of Nikopol on the Danube. Pop., 1910, 23,049.

Plevna is famous for the rôle which it played in the Russo-Turkish War of 1877. Garrisoned only by a small Turkish force at the beginning of the war, the place became, after the taking of Nikopol by the Russians (July 16, 1877), the centre of operations in the western part of the theatre of war in Bulgaria. Just as the Russians were preparing to march towards Sofia Osman Pasha arrived with a part of his army at Plevna. The Turkish forces at that point now amounted to 17,000 men with 58 guns, and the Russians dared not advance leaving this unexpected enemy in their rear. On July 20, 1877, an assault by a comparatively small force of Russians was repulsed, their loss being about 2800 men. The result of the first assault revealed to the Russians the strength of the Turkish forces at Plevna, and accordingly the Russian forces were increased to about 32,000 men with 176 guns. The second attack, on July 30, led by General Krüdener, was also unsuccessful, and the Russians lost over 7000 men. The besieging army was augmented by about 35,000 Rumanians, while the Turkish forces were also increased to about 36,000 men with 70 guns. On September 7 the bombardment was resumed, and in a desperate assault

on September 11 General Skobelev captured three trenches, but was compelled to abandon them on the following day. The Russians and Rumanians lost nearly 16,000 men between September 7 and 11, and it was then decided to invest the town by a large army and compel its surrender by cutting off its supplies. These operations were successfully carried out under the direction of Totleben, and the besieged army, which had by that time been increased to about 45,000 men, soon began to suffer from lack of supplies and ammunition. Osman Pasha finally decided to break through the Russian chain and accordingly crossed the Vid with his entire army on the night of December 9-10 and after an unsuccessful attack was thrown back towards the river, but, unable to cross the stream, surrendered unconditionally after a hard fight, in which he himself was wounded. The Russians took 40,000 prisoners and 77 guns. The total loss of the besieging army in killed and wounded was about 40,000 men.

Consult Osman Pasha, *Défense de Plevna, d'après les documents réunis par Mouzaffer Pasha et Taalat Bey* (Paris, 1889), and W. V. Herbert, *The Defense of Plevna* (London, 1896).

PLEXIMETER. See PERCUSSION.

PLEX'US. See NERVOUS SYSTEM AND BRAIN.

PLEYEL, plî'el, IGNAZ (1757-1831). An Austrian composer, born in Ruppersthal, near Vienna. He studied music under Wanhall and Haydn and made in early life an extensive tour of Italy to hear the works of the best composers. In 1789 he was made kapellmeister of the Strassburg Cathedral and there composed most of the works on which his popularity rests. In the winter of 1791-92 he was engaged as the conductor of the London Professional Concerts. He returned to Strassburg and subsequently went to Paris (1795) and after a successful career in that city as a publisher of music and pianoforte manufacturer retired to an estate which he had purchased near the capital. His compositions, consisting of 29 symphonies, numerous quartettes, concertantes, and sonatas, are full of agreeable melodies which caught the popular fancy. But the complete lack of all serious qualities caused them soon to fall into oblivion. He died on his own estate, near Paris.

PLIMER, pli'mèr, ANDREW (1763-1837). An English miniature painter. He was born at Wellington (Shropshire) and was the servant and then the pupil of Richard Cosway (q.v.) whose style he imitated and whom he succeeded as a favorite miniaturist of the court. He is excellently represented by 26 works in the Morgan collection, Metropolitan Museum, New York.

His elder brother, NATHANIEL (1757-1822), who was born at Wellington and was for a time assistant to Henry Bone the enameler, also painted miniatures in the same style as, but inferior to, those of Andrew. The Morgan collection contains good specimens of his work also. Consult G. C. Williamson, *Andrew and Nathaniel Plimer* (London, 1903).

PLIMSOLL, plim'sol, SAMUEL (1824-98). An English reformer, known as The Sailor's Friend. He was born and educated in Bristol. As a coal dealer in London he began to take an interest in the carrying trade and to remark upon the risks to sailors in being shipped upon overladen or unseaworthy, yet largely insured, vessels. As a member of Parliament (for Derby) and by his book *Our Seamen* (1873), he

led in the discussion of shipping abuses. In 1875 Plimsoll caused an exciting scene in the House of Commons by his violent attack upon ship-owners, some of whom were present. Eventually he secured the enactment of the Merchant Shipping Act of 1876, which remedied the sailors' grievances. His *Cattle Ships* (1890) was written to gain reform. See also LOAD-LINE MARKS OF VESSELS.

PLIMSOLL MARK. See LOAD-LINE MARKS OF VESSELS.

PLINLIMMON. See PLYNLIMMON.

PLINTH (Lat. *plinthus*, from Gk. *πλινθος*, *plinthos*, brick, tile, plinth). The square member at the bottom of the base of a column, also the plain projecting band forming a base of a wall. See ORDERS OF ARCHITECTURE.

PLIN'Y THE ELDER, GAIUS PLINIUS SECUNDUS (23-79 A.D.). The author of the celebrated *Historia Naturalis*. He was born in the north of Italy, probably at Novum Comum (Como). Whether it was his birthplace or not, Novum Comum was certainly his family's place of residence, since he had estates in its neighborhood. While still young he was sent to Rome, where his ample means and high connections secured him the best education. At the age of 23 he entered the army and served in Germany as commander of a troop of cavalry under Lucius Pomponius Secundus, of whom in later life he wrote a memoir. He traveled over nearly all the frontier of that extensive province, visited the Chauci and the sources of the Danube, composed during the intervals of military duty his treatise *De laoculatione Equestri*, and commenced a history (afterward completed in 20 books) of the Germanic wars. On his return to Rome in 52, he entered on the study of jurisprudence; but his pleading was unsuccessful, and accordingly he retired to his native place. There he wrote his *Studiosus*, a treatise in three books on the training of a young orator from the nursery to his entrance on public life, apparently intended to guide the education of his nephew, Pliny the Younger (q.v.); also his grammatical work, *Dubius Sermo*, in eight books. Shortly before Nero's death we find him a procurator in Spain, where in 71 he heard of his brother-in-law's decease and of his being intrusted with the guardianship of his nephew, Pliny the Younger, whom he adopted on his return to Rome, before 73. Vespasian, the reigning Emperor, whom he had known while in Germany, received him as one of his most intimate friends, and it was at this period that he completed, in 31 books, and brought down to his own time the Roman history of Aufidius Bassus. He collected an immense mass of materials, from which he compiled his great *Historia Naturalis*, published about 77. No fewer than 160 *volumina* of notes were found at his death, two years afterward. At the time of the great eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii, in 79, he was stationed off Misenum in command of the Roman fleet. Eager to examine the phenomenon more closely, he landed at Stabiae, where he was suffocated by the vapors caused by the eruption. He was, as his nephew tells us, corpulent and asthmatic, and so sank the more readily. None of his attendants shared his fate. The story of his death is described in two letters of his nephew, Pliny the Younger, to Tacitus, written many years after the event (*Epistles*, vi, 16 and 20).

Of all his works, only his *Historia Naturalis* has come down to us. It comprehends discussions of astronomy, ethnography, anthropology, meteorology, geography, mineralogy, zoölogy, botany, of everything, in short, which is a natural or nonartificial product. Moreover, the work is interspersed with digressions on such subjects as human institutions and inventions and the history of fine arts. It is divided into 37 books, the first of them being a dedicatory epistle to Titus, with a table of contents of the remaining books, and embraces, as we are told in the preface, 20,000 matters of importance, extracted from about 2000 volumes. Its scientific merit is not great. There is little attempt at philosophical arrangement; the observations are nearly all taken at second hand and show small discrimination in separating the true from the false or the probable from the marvelous. His meaning is often obscure, owing to his lack of personal acquaintance with the matters of which he treats and his failure to grasp the true sense of the authors whom he cites or translates. But the work is a great monument of industry and research and most valuable as supplying us with details on a great variety of subjects about which we have no other means of information. The best critical editions of the text are those of Sillig (8 vols., Gotha, 1851-58), Jan (Leipzig, 1875-80), and Mayhoff (a recension of Jan, Leipzig, 1875-1908; vols. i and ii have appeared in a third edition, 1906, 1909). There is an old English translation by Holland (London, 1601), and a more recent one, in Bohn's Library, by Bostock and Riley (London, 1855-57). Pliny's chapters on the history of art are edited, with commentary, by Jex-Blake and Sellers (London, 1896). Consult: G. A. Simcox, *A History of Latin Literature*, vol. ii (New York, 1883); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910); Martin Schanz, *Geschichte der römischen Literatur*, vol. ii, part ii (3d ed., Munich, 1913).

PLINY THE YOUNGER (GAIUS PLINIUS CÆCILIUS SECUNDUS). A nephew of Pliny the Elder (q.v.) and son of Gaius Cæcilius. He was born at Novum Comum (Como) 62 A.D. He was still young when he lost his father and was adopted by his uncle, under whose care and that of his mother, Plinia, and his tutor, Virginus Rufus, his education was conducted. Passionately devoted to literature, he wrote a Greek tragedy at the age of 13. He studied eloquence under Quintilian (q.v.) and became so famous for his literary accomplishments that he acquired the reputation of being one of the most learned men of his age. His oratorical powers were also considerable: in his nineteenth year he began to speak in the Forum, and his services as an advocate before the court of the centumviri (q.v.) and the Roman Senate were in frequent request. He held numerous official appointments; served, while a young man, as *tribunus militum* in Syria, where he listened to the teaching of Euphrates the Stoic and Artemidorus; was afterward *quæstor Cæsaris*; was prætor about 93 and consul in 100, when he wrote his *Panegyricus*, a eulogy of the Emperor Trajan. He was appointed, in 103, proprætor of the Provincia Pontica or Bithynia, an office which he vacated in less than two years; and he also discharged the function of curator of the banks and channel of the Tiber. He was twice married, his second wife being Calpurnia, grand-

daughter of Calpurnius Fabatus. Our knowledge of Pliny the Younger is mainly derived from his letters or *Epistolæ*, of which there are 10 books. He collected them himself and probably wrote many of them with a view to publication. They hold a high place in epistolary literature and give us many interesting glimpses into the life of their author and his contemporaries. Pliny himself appears in them to considerable advantage, as a genial and philanthropic man, enamored of literary studies and fond of improving his estates by architectural adornment. His ample fortune was liberally bestowed, and his slaves always found in him an indulgent master. He never enjoyed robust health; but of the time or cause of his death we know nothing. Of his letters, one of the most interesting is the one to the Emperor Trajan (x, 97), written while Pliny was Governor of Bithynia and asking for instruction in regard to the policy to be pursued against the Christians; this is one of the earliest notices of the Christians in Roman writers. The best editions of the text of Pliny's *Panegyricus* and *Epistolæ* together are those of Schæfer (Leipzig, 1805), Kell (ib., 1892), Müller (ib., 1913), and E. T. Merrill (ib., 1914). Annotated editions of *Selected Letters* were published by Church and Brodribb (London, 1871) and E. T. Merrill (ib., 1903). Of English translations, there are the *Panegyricus* by Bond (London, 1724) and the *Epistolæ* by Melmoth (ib., 1746; 10th ed., 1805), Lord Orrery (ib., 1752), and J. D. Lewis (ib., 1879). An excellent sketch of Pliny's life by Rendall is printed in Mayor's edition of book iii of the *Epistolæ* (ib., 1880) and in Merrill's edition of *Selected Letters*. Consult also: Church and Brodribb, *Pliny's Letters* (Philadelphia, 1875); G. A. Simcox, *A History of Latin Literature*, vol. ii (New York, 1883); W. S. Teuffel, *Geschichte der römischen Literatur*, vol. ii (6th ed., Leipzig, 1910); Martin Schanz, *Geschichte der römischen Literatur*, vol. ii, part ii (3d ed., Munich, 1913).

PLIOCENE EPOCH (from Gk. *πλειων*, *pleiōn*, more, comparative of *πολύς*, *polys*, much, many + *καινός*, *kainos*, new). The name given by Sir Charles Lyell to the uppermost division of the Tertiary system. Pliocene rocks are not extensively developed in America, but in Europe they are of great importance. Along the Atlantic coast of the United States isolated areas have been found from Virginia southward to Florida; and similar patches occur on the Pacific coast, the Merced series of the San Francisco peninsula having a thickness of nearly 6000 feet. In the interior there are a number of Pliocene basins in which fresh-water strata were deposited. The Goodnight and Blanco stages of Texas and similar strata in Kansas, Oklahoma, and Oregon were laid down in fresh-water lakes. The Pliocene of Europe comprises extensive deposits in Spain, France, Italy, Sicily, and Greece, and smaller areas in Belgium, northern France, and England. The life of the Pliocene epoch is quite modern in character, although many species of both plants and animals are no longer existent. The rhinoceros, horse, llama, sloth, mastodon, and peccary inhabited North America at that time, while the European fauna included many forms which resemble those living at present in Africa. The most interesting fossil of Pliocene age is that of a manlike ape, *Pithecanthropus erectus*, from the

island of Java, supposed by some anthropologists to be an ancestral type of man. See MAN, SCIENCE OF, *Ancient Types*; also TERTIARY SYSTEM.

PLIOSAURUS (Neo-Lat., from Eng. *pliocene* + Gk. *σαῦρος*, *sauros*, lizard). A gigantic Plesiosaurus with large head and short neck. See PLESIOSAURUS.

PLIQUE-À-JOUR. See ENAMEL.

PLOCK, plòtsk. A government occupying the northwestern part of Russian Poland, consisting of seven districts and bounded by Prussia on the north. Area, 4200 square miles (Map: Russia, B 4). The surface is slightly elevated towards the north and slopes towards the valley of the Vistula. Its chief rivers are the Vistula, which forms the southern and western boundaries of the government, and the Narev. The soil is well adapted for agriculture, which is the chief occupation within this government. Rye, potatoes, oats, and beets are the principal agricultural products, the last named being raised for the beet-sugar mills in the governments of Plock and Warsaw. Stock breeding is also important. The manufacturing industries are confined mostly to the production of sugar, flour, and trimmed lumber. The government was occupied by the Germans during the European War which began in 1914. (See WAR IN EUROPE.) Pop., 1913, 753,700.

PLOCK. One of the oldest cities of Russian Poland and capital of the Government of Plock, picturesquely situated on the right bank of the Vistula, about 60 miles west-northwest of Warsaw (Map: Russia, A 4). It is a pretty town with a fine public garden, a town hall, a cathedral founded in the twelfth century, two Gymnasias, a seminary for teachers, a theatre, and a number of libraries. The manufacturing industries are of little importance, but there is a considerable trade in grain, which is carried by the Vistula to Germany. Pop., 1910, 30,771, mostly Jewish. Plock is mentioned in connection with the introduction of Christianity into Poland in the tenth century. It was the capital of the mediæval Principality of Masovia. Plock was captured by the Germans in 1915. See WAR IN EUROPE.

PLOESTI, plò-yèsht'yí. A town of Rumania. See PLOYESHTI.

PLOMBIÈRES, plòñ'byâr'. A fashionable watering place in the Department of Vosges, France, 13 miles south of Epinal (Map: France, N., M 5). It is picturesquely situated in a deep valley on the Augronne and is celebrated for a number of mineral and thermal springs, known since the time of the Romans. The springs are about 30 in number and have an alkaline reaction with a trace of arsenic. The waters are used both internally and externally for rheumatism, digestive maladies, and nervous disorders. The place was embellished by Stanislas Leszczynski in the eighteenth century and by Napoleon III in the nineteenth. There are sumptuous public and private bathhouses, a hospital founded by Stanislas, two large hotels, a casino, a park, and promenades. Pop., 1901, 1830; 1911, 1786. At Plombières in July, 1858, occurred the secret meeting between Napoleon III and Cavour which led to the conclusion of an alliance between France and Sardinia against Austria. See CAVOUR; ITALY.

PLÖNNIES, plë'ní-es, LUISE VON (1803-72). A German lyric and religious poet, born (Leis-

ler) at Darmstadt. Her sketches of travel in Belgium, published in 1847, and her translation of Vondel's *Lucifer* (1845) won her election to the Brussels Royal Academy. Her lyric ability is best shown by her translations, *Britannia* (1843), *Englische Lyriker des 19. Jahrhunderts* (1863), though some of her original works have merit, such as *Gedichte* (1844); a sonnet sequence, *Abälard und Heloise* (1849); *Die sieben Raben* (1862; 3d ed., 1866). Of her religious poems the best known are: *Lilien auf dem Felde* (1864); *Maria Magdalena* (1870), a drama; *David* (1873). Consult *Allgemeine deutsche Biographie*, vol. xxvi (Leipzig, 1888).

PLÖNNIES, WILHELM VON (1828-71). A German writer, son of Luise von Plönnies. He was born in Darmstadt, entered the Hessian infantry at 16, fought in the campaign of 1848-49 in Baden, and resigned in 1861. In belles-lettres he made himself known by a version of *Kudrun* (1853), by the poems *Immortellen des Schlachtfeldes* (1870) and *Schwannennieder* (1871), and by a satirical novel, *Leben, Wirken und Ende des Generals Leberecht vom Knopf* (1869; 2d ed., 1877; written under the pseudonym Ludwig Siegrist). His works on firearms are valuable. They include: *Neue Studien über die gezeugene Feuerwaffe der Infanterie* (1861-64); *Das Zündnadelgewehr* (1865); *Hinterladungsgewehre* (1867); *Die deutsche Gewehrfrage* (1871), with Weygandt.

PLON-PLON, plòñ'-plòñ'. A name given to Prince Napoleon, son of Jerome Bonaparte, in allusion to his cowardice in the Crimean War. The word is a corruption of *Plomb-plomb* (lead).

PLO'SIVES. See MUTES.

PLOTIA GENS. See PLAUTIA GENS.

PLOTINUS (Lat., from Gk. Πλωτίνος, *Plōtinos*) (c.205-270 A.D.). The most original and important philosopher of the Neoplatonic school. He was born, of Roman parents, at Lycopolis in Egypt; but he was so utterly indifferent to things human, "being ashamed almost to live in a body," that he never would divulge even his parentage. He would never allow his birthday to be celebrated, although he gave feasts on those of Socrates and Plato; nor would he permit a painter or sculptor to perpetuate his features or, as he called it, to produce the image of an image, the body being to him only a faint image of existence. His body was altogether contemptible in his eyes; he would see no physician in his illness, and was very sparing in the use of food, refraining from meat, often even from bread. Strangely enough, his desire for the study of philosophy did not arise before his twenty-eighth year, when he repaired to Alexandria, and there, after having sat at the feet of the great masters for some time without feeling satisfied with their teachings, he at last became acquainted with Ammonius Saccas, and in him found the desired teacher. (See AMMONIUS.) For 10 years he zealously attended his lectures, and, although he had agreed, with two fellow students, never to make known aught of Ammonius' teachings to the world, he yet became the chief representative and author of that school, less as a pupil than as an independent thinker who, taking his stand upon its theorems, developed them to their full extent. In 242 he joined Gordianus' expedition to Persia, in order to devote himself to the philosophy of India and Persia; but, when the Emperor was

murdered in Mesopotamia, he had to repair hurriedly to Antioch, whence, in 244, he went to Rome. His lectures there were attended by crowds not only of eager youths, but of men and women of the highest circles. Not only Platonic wisdom in Neoplatonic garb, but asceticism and the charm of a purely contemplative life, were the themes on which he, in ever-new variations and with an extraordinary depth and brilliancy, held forth; and such was the impression his earnestness made upon his hearers that several of them really gave up their fortunes to the poor, set their slaves free, and devoted themselves to a life of study and ascetic piety. Dying parents intrusted their children and money to him, well knowing that a more honest guardian and one more anxious for his charges could not be found. It is hardly surprising to find that his contemporaries coupled with his rare virtues the gift of working miracles. At the age of 60 he thought of founding an aristocratic and communistic commonwealth on the model of Plato's Republic, and obtained from the Emperor Gallienus a grant of two cities in Campania as a site for his Platonopolis; but courtiers prevented the fulfillment of this promise. Plotinus died at Puteoli (now Pozzuoli).

Plotinus' system was based chiefly on Plato's theory of ideas; but, while Plato assumed the ideas to be the link between the visible and the invisible, or between the supreme Deity and the world, Plotinus held the doctrine of emanation, i.e., the constant transmission of powers from the absolute to the creation, through several agencies, the first of which is pure intelligence, whence flows the soul of the world, whence, again, come the souls of men and animals, and finally matter itself. Men thus belong to two worlds, that of the senses and that of pure intelligence. It depends upon ourselves, however, to which of the two worlds we direct our thoughts most and finally belong. The ordinary virtues, such as justice, moderation, valor, and the like, are only the beginning and very first preparation to our elevation into the spiritual realm, purification, or the exercise of purifying virtues, is a further step, to which we attain partly through mathematics and dialectic; and the abandonment of all earthly interests for those of intellectual meditation is the nearest approach to the goal. The higher our soul rises in this sphere of intellect, the deeper it sinks into the ocean of the good and the pure, until at last its union with God is complete. Plotinus' philosophy, which, as it were, tried to combine all the systems of Anaxagoras, Parmenides, the Pythagoreans, Plato, and Socrates, and the Stoa into one, was the last and boldest attempt of the ancient Greek world to explain the mystery of the creation and of existence. Its influence upon modern philosophy is remarkable. From Spinoza to Schelling the reminiscences of Plotinus, irrespective of the drift of particular parts of individual systems, recur constantly. See NEOPLATONISM.

Plotinus' works include 54 treatises, in Greek, arranged in six enneads, or groups of nine books each, an arrangement due, probably, to Porphyry (q.v.), who edited Plotinus' writings. They were well-nigh forgotten, when Marsilius Ficinus first published a Latin paraphrase of them (Florence, 1492), which was followed by the *editio princeps* of the original (Basel, 1580, 1615). The first critical edi-

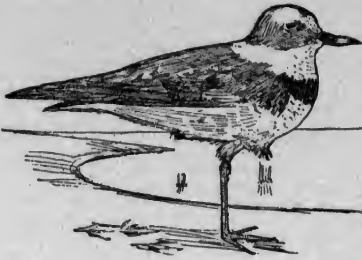
tion, however, is due to Creuzer (3 vols., Oxford, 1835). Others are those of Dübner (Paris, 1855), Kirchhoff (1856), Müller (with translation, 1878), Volkman (Leipzig, 1883-84). Parts of his works were translated into German by Engelhard (1820), Müller (1878), O. Kiefer (selections, Jena, 1905); into English by Taylor (1794, 1817; this was re-edited, with introduction and bibliography, in 1895, by G. R. S. Mead); into French by Bouillet (1861). Consult: C. H. Kirchner, *Die Philosophie des Plotinus* (Halle, 1854); Emil Brenning, *Die Lehre vom Schönen bei Plotin* (Göttingen, 1864); A. Richter, *Neuplatonische Studien* (Halle, 1864-67); Hugo von Kleist, *Plotinische Studien* (Heidelberg, 1883); Athanasios Pisyros, *Die Tugendlehre des Plotin* (Leipzig, 1895); A. Drews, *Plotin und der Untergang der antiken Weltanschauung* (Jena, 1907); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); K. S. Guthrie, *The Philosophy of Plotinus* (London, 1910); Christ-Schmid, *Geschichte der griechischen Litteratur*, vol. ii, part ii (5th ed., Munich, 1913).

PLOTZ, plōts, HARRY (1890-). An American bacteriologist. He was born in Paterson, N. J., and graduated from the College of Physicians and Surgeons (Columbia University) in 1913. While pathologist at Mount Sinai Hospital, New York, he discovered in 1914 the bacillus of typhus and demonstrated the identity of typhus with Brill's disease, a theory first brought forward in 1902. In 1915 he announced a protective vaccine against typhus and in July of the same year Dr. Plotz and Dr. George Baehr were sent by Mount Sinai Hospital to Servia, where an epidemic was raging, with a complete outfit for vaccination against typhus. See TYPHUS.

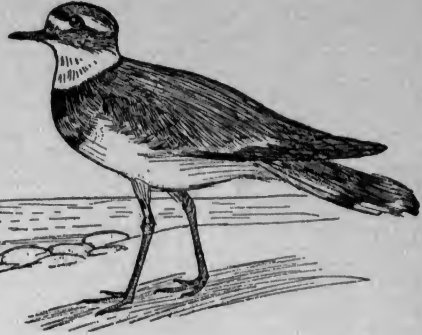
PLOUG, plōøg, PARMO CARL (1813-94). A Danish poet and politician, born in Kolding. As editor of *Fædrelandet* (the Fatherland) from 1841 to 1881 he used his pen to uphold the national Scandinavian spirit. He was a member of the constitutional convention in 1848-49, and from 1854 to 1857 of the Folkething. His popular student songs were published under a pen name as *Poul Rytters Viser og Vers* (1847), and in 1861 his complete poems, *Samlede Digte* (5th ed., 1876), appeared. His later volumes of verse, erotic and patriotic, were *Nyere Sange og Digte* (1869), *Nye Digte* (1883), and the posthumous *Efterladte Digte* (1895). His son, Hother Ploug, edited a standard edition of his father's poems in two volumes (1901).

PLOVER, plūv'ēr (OF. *plovier*, Fr. *pluvier*, from ML. *pluvarius*, plover, from Lat. *pluvia*, rain, from *pluere*, to rain; connected with Gk. *πλεῖν*, *plein*, Skt. *plu*, *pru*, to swim, and ultimately with Lith. *plusti*, Lett *pludet*, AS. *fleoetan*, OHG. *fliozzan*, Ger. *flessen*, to flow; so called because the bird appears during the rainy season). A limicoline bird of the subfamily Charadriinae, of the large shore-bird family Charadriidae, having a bill somewhat like that of a pigeon, with a convex horny terminal portion, behind which it is contracted; the legs not very long, naked a little above the tarsal joint; the wings rather long and pointed, the first quill feather the longest; and usually only three toes. The species are about 60 in number, found in every quarter of the globe, and many are migratory and of very wide range. As a rule they frequent low moist grounds, where

PLOVERS



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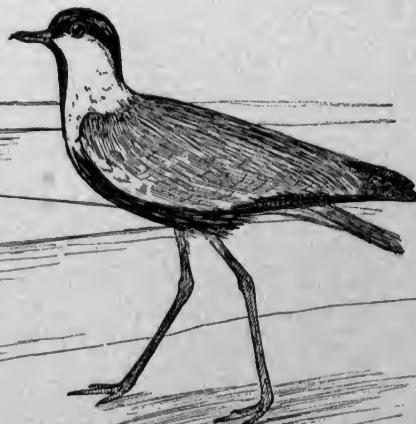
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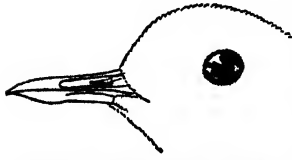


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1. WILSON'S PLOVER (*Ochthodromus wilsonius*).
2. KILLDEER (*Oxyechus vociferus*).
3. AMERICAN GOLDEN PLOVER (*Charadrius dominicus*).

4. BLACK-BELLIED PLOVER (*Squatarola squatarola*).
5. LAPWING (*Vanellus vanellus*).
6. EGYPTIAN SPUR-WINGED PLOVER (*Hoplopterus spinosus*).

they congregate in flocks, and feed on worms, insects, and the like. Some of them are table delicacies. The golden or yellow plover (*Charadrius dominicus*) is 11 inches long, blackish, speckled with yellow at the tips and edges of the feathers;



BEAK OF THE GOLDEN PLOVER.

the throat, breast, and belly black in summer, whitish in winter. It is a bird of passage in the United States, breeds in the far north, and winters in Central and South America,

going even as far south as Patagonia. In the eastern United States it is more common in autumn than in spring. It makes an artless nest, little more than a slight depression of the ground, and lays four eggs. The parent birds show great anxiety for the protection of their young, and use various stratagems to divert the attention of an enemy. The genus *Agialitis* comprises the ringed plovers, much smaller birds, characterized by their dark neck bands. The ringed plover (*Agialitis hiaticula*) is found in Greenland and the Arctic regions of America, but is most abundant in the northerly parts of the Old World. It occurs at almost all seasons on sandy and shingly flats, from which the sea retires at ebb tide. It is often to be seen also on the banks of large rivers, lakes, and ponds. It is grayish brown above, whitish beneath, with a collar of white round the neck, and below it a black, in winter a brown, collar; the head marked with black and white; a white bar on the wing.

In the United States six species exist, all closely resembling the ringed plover, of which the semipalmated or ringneck (*Agialitis semipalmata*) is the American analogue. The largest and best known is the killdeer (q.v.) The piping plover (*Agialitis meloda*) is found along the Atlantic coast and is notable for the musical quality of its notes. The snowy plover (*Agialitis mvosa*) is a handsome species found in the southwestern United States. All the ring plovers lay their three or four eggs in a depression in the ground; the eggs vary in color from creamy white to olive drab, heavily marked with blackish brown. In the western United States occurs the mountain plover (q.v.), which differs from the others in the absence of any black belt or markings on the neutral surface. The beetlehead or black-bellied plover (*Squatarola squatarola*) is a nearly cosmopolitan form, recognizable in any plumage by the small hind toe and the rounded scales on the front of the tarsus. It is nearly a foot long, and in full plumage is a very handsome bird, black and white contrasting in its plumage to make it notable. It breeds in the Arctic regions and winters in the tropics. The bird known to American sportsmen as the upland plover is not a plover at all, but a sandpiper (*Bartramia longicauda*).

Several remarkable birds of this group belong in South America, Africa, and Australasia. One of these is the Egyptian spur-winged plover (q.v.; see also CROCODILE BIRD). Another is the strange crook-billed plover of New Zealand. (See WRYBILL.) Closely allied to them are the European and Asiatic lapwings and the South American *teru-teru* (q.v.) of the widespread genus *Vanellus*. Consult: G. E. Shelley, *Birds*

of Egypt (London, 1872); Dresser, *Birds of Europe* (ib., 1881); Walsingham and Galloway, *Shooting* (2 vols., ib., 1886); H. Seebohm, *Birds of Asia* (ib., 1888); Buller, *Birds of New Zealand* (2d ed., ib., 1888); Sharpe and Hudson, *Argentine Ornithology* (ib., 1888); W. B. Lefringwell, *Shooting on Upland, Marsh, and Stream* (Chicago, 1890); D. G. Elliot, *Shore Birds of North America* (New York, 1895). See Plate of EGGS OF WATER AND GAME BIRDS; and Plate of PLOVERS.

FLOW, PLOWING (AS. *plōh*, OHG. *pfluoh*, Ger. *Pflug*, plow, connected with Longobardic *plovum* and possibly with Gk. *γλωχίν*, *glōchin*, projecting point). In all countries where agriculture is in an advanced state the first agricultural operation in order and importance is plowing to break up the soil and invert the upper stratum. Such an operation also buries and destroys weeds; leaves the surface clean, unencumbered, and in a condition favorable for weathering; increases the storage capacity of the soil for water, but also assists percolation and thus aids in drying and warming the soil.

The plow, though simple in appearance, is the product of slow evolution and much mechanical

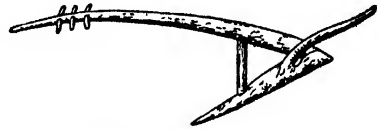


FIG. 1. PRIMITIVE PLOW.

skill. The plow in primitive form probably antedates history. The Old Testament mentions plows shod with iron or bronze, but except in western Europe and America little progress has been made in improving the implement since the time of Herodotus. One of the earliest types of plows is shown in Fig. 1; a type of the ordinary modern plow in its simple form in Fig. 2. As will be seen, the modern

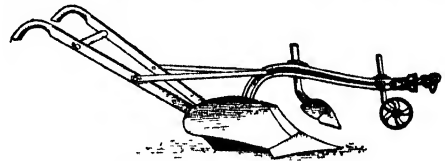


FIG. 2. AMERICAN PLOW.

plow consists of several parts—a beam, by which the plow is drawn, which may be of wood or metal; two handles, usually wood, fastened to the beam with braces, for guiding. To the end of the beam a clevis or bridle is attached for convenience in hitching the team and regulating the depth and width of furrow, and near the outer end a small adjustable wheel (frequently omitted) for assisting in steadying the plow and regulating the depth of the furrow. Behind this is a coulter for cutting the furrow slice at the side. This coulter takes various forms—a miniature plow or jointer, a stout iron knife, or a revolving disk with sharp edge. Back of the coulter is the plow proper, consisting of a forged-steel, malleable-iron, or cast-iron frog to which is attached a pointed share for cutting the furrow slice at the bottom, a moldboard for turning the furrow slice, and the landside opposite the moldboard, which presses against the side of the furrows and helps

to steady the plow. In the best plows these latter parts are usually made of soft-centre steel or chilled iron.

The first patent for a plow is said to have been obtained by Joseph Foljamb in 1730, and Jethro Tull about this time invented a plow designed especially to pulverize the soil thoroughly, an idea embodied in modern plows of the best type. The Dutch were the first to improve the primitive Roman plow. Figure 3

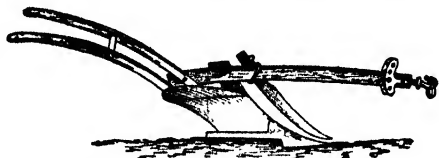


FIG. 3. EARLY DUTCH PLOW.

shows the Rotherham plow used in Holland at the beginning of the eighteenth century and afterward introduced into England, which contained most of the fundamental ideas of the modern plow.

In attempts to improve the plow the moldboard, which raises and turns the furrow slice and which appeared in the plows of the Netherlands during the seventeenth century, has probably received more attention than any other single part. Thomas Jefferson, who published his views in 1798, and James Small, in 1802, were among the first to attempt to establish the proper lines of the moldboard upon a mathematical basis. As determined by the shape of the moldboard, ordinary plows are of two main types: (1) sod plows, with long sloping moldboard, which turn a narrow, flat furrow without pulverizing the furrow slice, but which bury vegetation, sod, manure, etc., effectually; and (2) the stubble plows, with short, steep, overhanging moldboard, which break up the furrow slice and pulverize the soil. English plows are generally of the first type. The modern American plow is generally of the second type, although plows of the first type are made and used to a considerable extent for special purposes in America, as, e.g., in breaking tough sod land. The first American patent for a plow was granted to Charles Newbold in 1797 for a cast-iron plow, but the modern type of American plow may be said to date from Sept. 1, 1819, when Jethro Wood, of Scipio, N. Y., took out a patent for an improved cast-iron plow having the moldboard (of pulverizing type), share, and landside cast in three separate pieces so that they could be replaced by new parts when worn. Wood gave the American plow its proper shape. The next important improvement on his ideas was the substitution of steel for cast-iron parts, as was done by John Lane in 1836 and John Deere in 1837, resulting in the modern steel plow.

Anderson found that 55 per cent of the draft of the plow is consumed in cutting the furrow slice, 12 per cent in turning it, and 33 per cent by the sole and landside. Since such a small percentage of the energy required in plowing is consumed by the moldboard, it would seem to be economy to make this of such form that it will disintegrate the furrow slice as completely as possible. Such breaking of the furrow slice makes it easier for the tillage implements following the plow to fine the soil thoroughly without disturbing the buried sod and vegetation.

A further important advantage of the work of such plows is the increased opportunity afforded to the soil for weathering.

There are numerous kinds of plows used for special purposes, such as trench or ditching plows, which are made on the same principle as the common plow, but larger and stronger, so as to bring up a portion of the subsoil to the surface; or subsoil plows, which have no moldboard and merely stir and break up the subsoil, thus facilitating drainage. There are also double moldboard plows, which are merely common plows with a moldboard on each side, employed for water furrowing, etc.; the hillside or swivel plow, which is provided with a reversible moldboard, so that the team may walk in the opposite direction, but always place the furrow against the one previously turned. Another special form of plow is the double-furrow or gang plow, which consists of an iron frame, usually mounted on a wheel or wheels, carrying two or more plows, one set a little to the rear of the other, and at the distance it is desired the width of the furrow should be. The sulky plow (Fig. 4), which may also be a gang

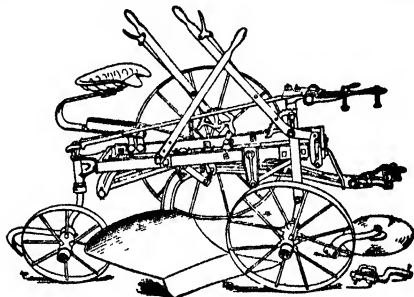


FIG. 4. SULKY PLOW

plow, has also come into extensive use, the object of such plows being to lessen friction and reduce the labor of the plowman. The draft of such plows, however, was found by Sanborn to be not materially less than that of the ordinary swing plow. The first patent for sulky plows in America was granted to H. Brown in 1844, but practical plows of this type were not made until about 1864, and the manufacture of such plows is still in a state of evolution, although numerous forms are found on the market. The disk plow (Fig. 5), which is a comparatively recent invention, has attracted wide attention on

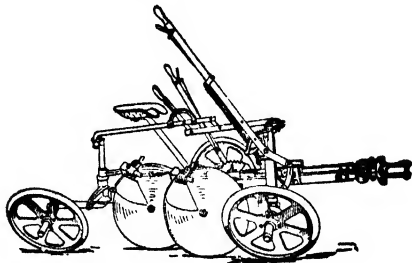


FIG. 5. DISK PLOW

account of its effective work under certain conditions. The principal feature of this plow in its more perfect form is a tempered steel disk (usually two disks) 25 to 30 inches in diameter, set at an angle to the furrow and to the sur-

face so as to turn and pulverize the soil. It is kept from clogging and assisted in pulverizing the soil by an adjustable scraper. The disk is carried by a steel framework mounted on wheels and provided with a seat for the driver and levers for control and adjustment of the plow.

The idea of the use of engines and machinery for plowing seems to have originated with David Ramsey and Thomas Wildgosse in 1818, but the history of practical motor plowing dates from

and durable engine of sufficient traction and adapted to different kinds of land. On the Western wheat ranches there has, according to Taylor, been "developed a special form of engine for plowing, harvesting, and similar work. These engines have assumed a tricycle form, the weight of the boiler and engine resting on two very high, wide tread wheels with a third wheel of caster type in front for easy steering. A high-pressure, forced-draft boiler is used, and

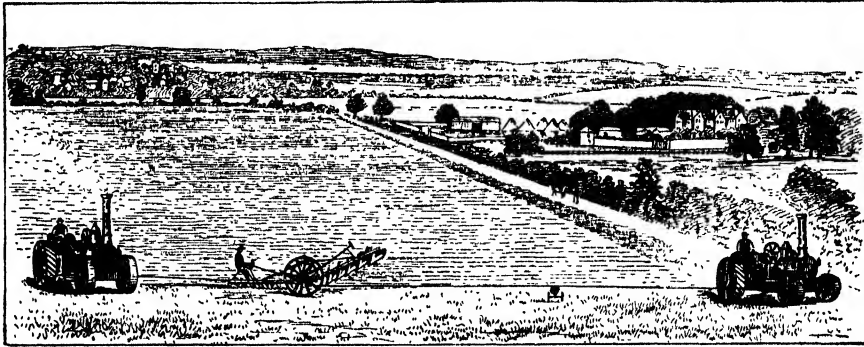


FIG. 6. DOUBLE-ENGINE OR DIRECT METHOD OF STEAM PLOWING.

the invention of Fowler, assisted by Smith, in 1854. The inventions along this line have included plans for engines traveling over the surface of the ground, drawing plows or other cultivating implements along with them; engines working on tramways and drawing implements after them; engines moving along opposite headlands and working implements between them by means of wire ropes and stationary engines driving implements also by means of wire ropes. The steam plows used most widely in England belong to two classes—double-engine and single-engine, or direct and roundabout (Figs. 6 and 7). Gang plows carried on wheels are usually employed in these systems, the plows being in two series facing in opposite directions and so

small, high-speed engines, developing from 40 to 80 horse power. Such engines draw from 12 to 18 twelve-inch plows, and turn over 25 to 40 acres per day." But in many places these have been displaced by the gasoline tractor. A system using electricity on the trolley plan has been introduced in Germany with some success. It is claimed for the better systems of motor plowing that they are cheaper and more efficient than the ordinary methods. This may be true where horses and feed are expensive, fuel cheap, and lands level and otherwise well suited to these systems; but that it is universally true remains to be demonstrated.

The time and manner of plowing will be determined by the special object to be attained.

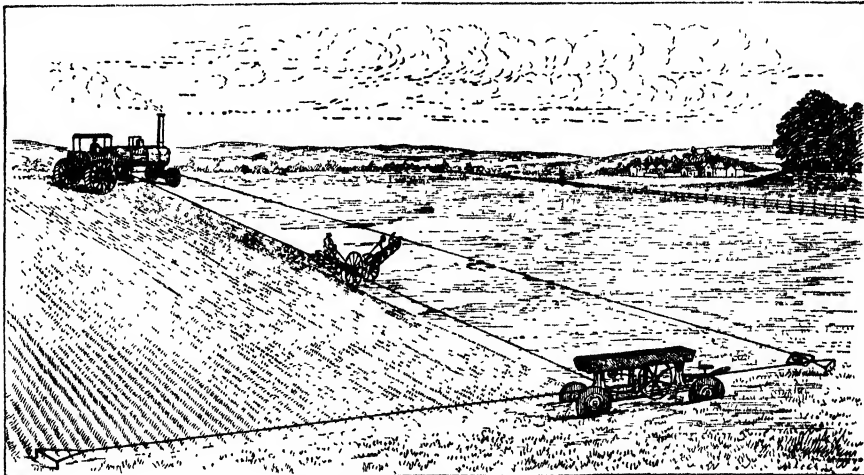


FIG. 7. SINGLE-ENGINE OR ROUNDABOUT METHOD OF STEAM PLOWING.

arranged that when one series is in operation the other is elevated above the soil. The motor plows used in America are of the gang class, drawn by a traction motor, as shown in Fig. 8. Attention of American inventors has been directed mainly towards developing a cheap, light,

In soils more or less impervious to water it is advisable to plow to different depths at different seasons of the year in order to prevent the formation of hardpan, which occurs when plowing to the same depth for several seasons, due to the pressure of the plow and the trampling

of the teams. If the soil is very pervious it is sometimes desirable to promote this formation of hardpan to arrest a too rapid percolation of water. Plowing promotes aëration of the soil and nitrification (q.v.) and otherwise improves the physical and chemical condition of soils, resulting in increased productiveness. A deep-tilled layer of soil is desirable, but this should be brought about gradually, since the plowing should not be so deep as to bring up raw subsoil. Plowing to a greater depth than 6 or 7 inches is rarely desirable. The time and manner of plowing will be determined by climatic conditions, character of soil, and kind of crop to be raised. Sod may be plowed wetter than stubble land. In midsummer and fall deep plowing is desirable; in early spring rather shallow plowing is usually best. Manures and similar material should not be turned under deeply in

his case, and the matter was dropped. After the accession of Elizabeth he failed of political preferment because he was a Roman Catholic; but he retained his reputation as the greatest lawyer of his day and as a fearless and upright public man. During his early career he was twice a reader of the Middle Temple, and he was its treasurer at the time when its present fine library was begun. (See INNS OF COURT.) He frequently appeared in court against the government as counsel for those of his own faith, Bishop Bonner being one. His reputation rests chiefly on a series of reports of trials, *Les Comentaires, etc.* (1571; Eng. trans., 1792, 1816), written in law French. Extending over the entire period of his connection with the bar, they are valuable as a clear and accurate record of the precedents of the author's time. Besides these he wrote *Les Quæres del Monsieur Plowden*

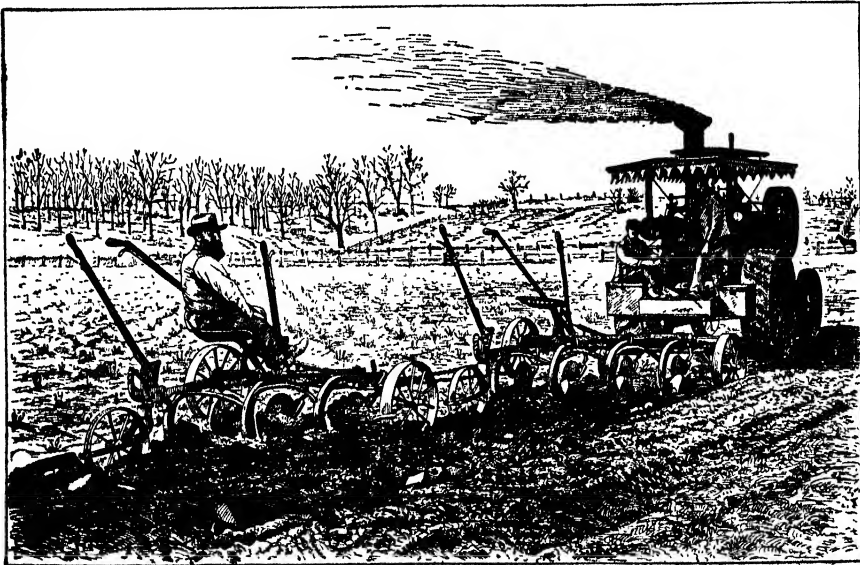


FIG. 8. AMERICAN METHOD OF STEAM PLOWING.

the spring. If there is danger of too rapid evaporation, surface tillage should follow very closely after plowing. Fall-plowed land should generally be left rough. Unless the soil has very good natural drainage the plowed land should have open furrows from 10 to 15 paces apart.

Bibliography. J. W. Gilbert, *Inventor of the Modern Plow* (Chicago, 1882); I. P. Roberts, *Fertility of the Land* (New York, 1897); W. P. Brooks, *Agriculture*, vol. i (3d ed., 3 vols., Springfield, 1901); King, *Physics of Agriculture* (Madison, 1901); Davidson and Chase, *Farm Machinery and Farm Motors* (New York, 1908); "Plows and Plowing," in *Missouri State Agricultural Experiment Station, Bulletin No. 32* (Columbia, 1888); "Plow Trials," in *Utah State Agricultural Experiment Station, Bulletin No. 2* (Logan, 1890); "Agriculture," in *United States Census Reports* (Washington).

PLOWDEN, EDMUND (1518-85). An English jurist, born at Plowden, Shropshire. He studied at Cambridge, in 1538 entered the Middle Temple, and was called to the bar. He was several times member of Parliament, and was one of the 39 who, in 1554-55, withdrew dissatisfied, and against whom the Attorney-General filed informations. Plowden ably defended

(Eng. trans., 1662). Consult: Thomas Fuller, *The Worthies of England* (London, 1662; new ed., ib., 1840); James Granger, in *Biographical History of England* (ib., 1824); Wallace, *The Reporters* (Boston, 1882).

PLOWLAND. See CARUCATE.

PLOWMAN'S TALE, THE. A rhyming ballad by an unknown poet, written about 1395, printed as a Canterbury tale in Thynne's second edition of Chaucer, 1542. It is a denunciation of Roman Catholicism in the story of a dispute heard by a plowman between a griffin (Rome) and a pelican (Lollardism).

PLow MONDAY, or ROCK MONDAY. The name of the Monday after Twelfth Day, or the close of the Christmas holidays, when the work of the plow is supposed to start again. In England in some places the day is devoted to rustic sports. A plow is dragged from door to door by plowmen, who ask for contributions.

PLOYESHTI, plô-yesh'tê, or **PLOESTI** (Rum. *Ploesti*). A town of Rumania, capital of the Department of Prahova, 38 miles north of Bucharest (Map: Balkan Peninsula, F 2). It is advantageously situated in a petroleum-bearing district and is rapidly increasing in commercial importance. Its educational in-

stitutions include a lycée, a school of arts and crafts, an institution for teachers, and a commercial school. It is an important military and railway centre. Pop., 1900, 42,687; 1912, 56,594.

PLÜCKER, plük'ër, JULIUS (1801-68). A German mathematician and physicist, born at Elberfeld. After holding positions at the universities of Halle and Berlin he became professor of mathematics at Bonn (1836). Plücker produced works of very great importance in the field of analytic geometry. In his *Analytisch-geometrische Entwicklungen* (2 vols., 1828, 1831) he developed the dual relation between modern analysis and pure geometry. The *System der analytischen Geometrie* (1835) deals extensively with the classification of cubic curves. His *Theorie der algebraischen Curven* (1839) contains the famous six equations relating to the singularities of higher plane curves. (See CURVE.) This was followed by his *System der Geometrie des Raumes in neuer analytischer Behandlungsweise* (1846; 3d ed., 1852). From 1847 onward Plücker devoted his attention to physics and became professor of this science at Bonn. He devoted his attention especially to the magnetic properties of gases and fluids, to the electric luminosity of rarefied space, and to the phenomena of the spectroscope and the Geissler tubes. In 1865 Plücker once more turned his attention to mathematics and invented what is now called line geometry. He died before he had finished the publication of a work on this subject containing his theory of complexes and congruences (see CONGRUENCE), but it was completed by his pupil and assistant, Klein, under the title *Neue Geometrie des Raumes gegründet auf die Betrachtung der geraden Linie als Raumelement* (1868-69). His scientific memoirs were published in the *Proceedings* of the Royal Society of Science at Göttingen. He was also a contributor to the *Philosophical Transactions* of the Royal Society. Among the papers contributed are: "On a New Geometry of Space" (1865, vol. clv); "On the Magnetic Induction of Crystals" (1858, vol. cxlviii); "On the Spectra of Ignited Gases" (1865, vol. clv). Consult Clebsch, *Zum Gedächtnis an J. Plucker* (Göttingen, 1872), and Dronke, *Julius Plucker* (Bonn, 1871). His *Gesammelte Abhandlungen* have been published in two parts by the Royal Society of Göttingen (Leipzig, 1895-96).

PLUM (AS. *plāme*, *plȳme*, OHG. *pfūmo*, *pfūma*, Ger. *Pflaume*, from Lat. *prunum*, plum, *pruna*, plum tree, from Gk. *πρῶνον*, *prounon*, *πρῶνον*, *proumnon*, plum, *πρῶνη*, *prounē*, *πρῶμη*, *proumnē*, plum tree). Small trees or shrubs belonging to the genus *Prunus* and extensively cultivated as orchard fruits in temperate regions. The fruit is distinguished from the peach, its near relative, by its smooth skin and unwrinkled stone. It is larger than the cherry and is further distinguished from it by the bloom covering it. There are three main groups of widely cultivated plums: (1) domestica or European plum (*Prunus domestica*), (2) Japanese plum (*Prunus triflora*), and (3) native American plums, cultivated only in America, having been derived largely by selection during the closing years of the nineteenth century from numerous native species, the most important of which are: Americana types, from *Prunus americana*, commonly found from the Atlantic west to the Rocky Mountains and south to the Gulf; the Wild Goose or Hortulana types, from

Prunus hortulana; and Chickasaw types, from *Prunus angustifolia*. The domestica varieties were the first plums cultivated in the United States. They thrive in the regions north of Pennsylvania and west to the Great Lakes and on the Pacific slope, where the American prune industry has reached its greatest development. The European plum (*Prunus domestica*) is native to eastern Europe and west-central Asia. Another plum native to southern Europe and extensively grown as a stock is the myrobalan or cherry plum (*Prunus cerasifera*). There are but very few cultivated varieties of this species. The Japanese plum (*Prunus triflora*) is native to China. In commercial importance it stands next to the European plums. Many varieties ripen much earlier than the European plums. The fruit is very firm and stands shipment well, and the trees are not so susceptible



WILD PLUM (*Prunus americana*).

to black knot and the curculio. They were first introduced in America about 1870, and have rapidly become popular in the United States, where they can be grown much farther south than the European plums. There are many varieties of most of the above species of plums now in cultivation, and in addition a large number of named hybrids. The South Dakota Experiment Station has originated some promising hardy plums for the northern prairie region by crossing the native Dakota plums and sand cherries with European and Japanese plums.

Plums true to variety are propagated usually by budding the seedlings in August or September. Whip grafting is used to some extent and has proved especially valuable in working plums on peach roots. They may also be top-worked in the same manner as apples. Plums, as a rule, do best in a deep, rather heavy soil with an open subsoil. The domesticas prefer a heavy clay soil, while the Japanese varieties and some of the hybrids may be grown on light sandy soils. Most varieties may be set in the orchard when one year from the bud or graft, but with the European plums two-year-old trees are preferred. Waugh and other investigators have shown that for all practical purposes native American plums and Japanese varieties are sterile to their own pollen and will not produce fruit unless the trees are mixed in the orchard with other varieties. Plums are set in the orchard about 15 feet apart each way. A few varieties require 20 feet each way. Pruning the plum is confined largely to the formation of the head during the first two or three years' growth in the orchard and afterward to removing dead and crossed branches. The plum orchard in America is usually plowed in early spring and kept well cultivated until the middle

of summer, when it is seeded to some cover crop. In some of the Northwestern States mulching with straw, marsh hay, etc., has been found preferable to cultivation. A moderate amount of barnyard manure applied every second year has been found beneficial in the plum orchard, and wood ashes on soils deficient in potash and lime. Most varieties of plums tend regularly to overbear, and thinning has been found necessary to secure the finest fruit, especially with the American varieties. The plums are left to stand 2 or 3 inches apart. They are marketed as soon as they become well colored. In the United States the eight-pound grape basket makes one of the most satisfactory packages.

Plum Diseases. Plums and cherries are often attacked by the same fungi. Leaf blight or shot hole is due to the presence of one or both of two fungi, *Cylindrosporium padi* and *Septoria cerasina*, in the leaves, the symptoms being alike on both plum and cherry. Circular purplish spots $\frac{1}{8}$ inch in diameter appear; later the tissues become brown and break out from the leaves, leaving holes as though made with shot. In severe cases the leaves turn yellow and the trees are defoliated. This disease can be prevented by spraying the trees with Bordeaux mixture at intervals of two weeks from the time the leaves appear until July. Another disease to which the plum and cherry are subject is the black knot or plum knot, due to *Plowrightia morbosa*, which appears as a serious pest only upon sour cherries and upon plums. When mature the black knots are rough wart-like excrescences upon the branches. At first they are yellowish in color, but soon become darker, the surfaces having a velvet-like appearance. This soon disappears and the knots grow still darker, in winter becoming black. The infested branches should be cut and burned, and where knots are on large limbs or upon the tree trunks they may be cut out or painted with kerosene. After careful pruning the trees may be sprayed during the growing season with any good fungicide (q.v.) to prevent the germination of any spores that may find lodgment. A disease peculiar to the plum is that known as plum pockets, due to attacks of *Eoascus pruni*. The fruit is infected soon after blossoming and begins to swell until it becomes an inch or two in length. At first the pocket is light in color, but finally becomes dark brown or black, and the fruit falls to the ground. It is usually hollow and bladdery in appearance, hence the name. The walls of the fruit are thickened, but it contains no stone or pit. The leaves and stems also are attacked, the affected parts assuming swollen, distorted shapes. This disease can be controlled to some extent by thorough use of fungicides. Applications should be made before the buds have opened and again just after the flowers have fallen. The plum and peach are attacked by the fungus *Cladosporium carpophilum*, which causes the well-known scab. Brown rot is also common on plums, often causing their rapid decay at ripening. Both diseases can be controlled by proper spraying. Consult: Edward Bartrum, *Book of Pears and Plums* (New York, 1903); W. P. Hedrick, *Plums of New York* (Albany, 1911); F. A. Waugh, *Plums and Plum Culture* (New York, 1912); W. F. Wight, "Varieties of Plums Derived from Native American Species," in *United States Department of Agriculture, Bulletin No. 172* (Washington, 1915); also publications of State

agricultural experiment stations. See ASCOMYCETES; and Colored Plate of DRUPES. See also PLUM INSECTS.

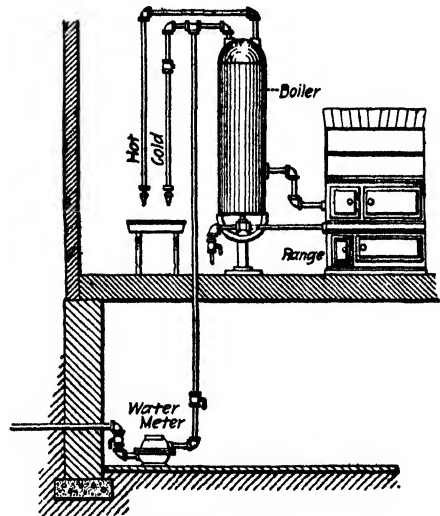
PLUM, BEACH (*Prunus maritima*). A species of plum growing upon the Atlantic coast from New Brunswick to Virginia and appearing again in Michigan along the lake. As a class beach plums are of little value for their fruit, only a single named variety being listed. For ornament, however, the group has greater merit, as the blossoms are rather large and showy and the fruits are of high color when ripe.

PLUM, DATE. See PERSIMMON.

PLUMAGE. See BIRD; FEATHER.

PLUMBAGO. See GRAPHITE.

PLUMBING (from *plumb*, from OF. *plomb*, *plom*, Fr. *plomb*, from Lat. *plumbum*, lead). In its broadest sense, the pipes and fixtures within houses or other buildings used to supply water, gas, and heat, including in the latter steam and hot water, and also the pipes used to remove liquid wastes from buildings; or the mechanic art of providing the pipes and fixtures named. A more restricted and more common use of the term includes only the water supply and house drainage systems, leaving gas fitting and steam and hot-water fitting in two separate classes. (See GAS, ILLUMINATING AND FUEL; HEATING AND VENTILATION.) The early plumber worked in lead, providing pipe systems for water supply, applying sheet lead for roof coverings, and setting window glass. Later lead pipe was adopted for other purposes, notably for gas services and for removing household wastes. Hence the name "plumber" originally applied to a worker in lead. Still later lead was largely replaced by other metals. (See PIPE.) Today the plumber and the gas, steam, and hot-water fitter employ lead, wrought-iron, brass, copper, and the various kinds of plated pipe, including nickel-plated goods. Vitrified clay or sewer pipe is not used in good plumbing, at least not in buildings, but vitrified pipe is



KITCHEN BOILER AND CONNECTIONS.

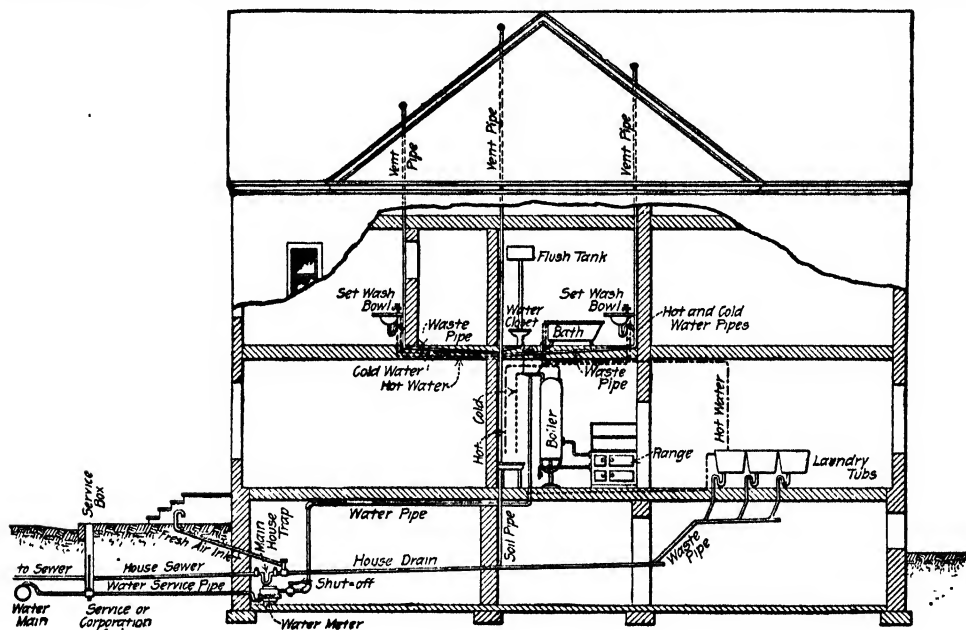
almost wholly used to connect the house and street sewerage systems.

Water Supply. The pipe leading from the street main to the building is called the house connection or service pipe and is frequently laid,

at least as far as the curb or sidewalk line, by the water department. The service pipe, and the water-pipe system within the house as well, may be of lead or wrought iron, or, if the building be large, the main piping may be of cast iron. In highly finished, expensive work brass or nickel-plated pipe is sometimes used, and copper may be employed for hot-water piping. As some waters attack and decompose lead and give rise to lead poisoning, the materials for service and house piping should be chosen with care. (See **SANITARY LAWS; WATER WORKS.**) A valve at the sidewalk enables the water department to turn on or shut off the water to the consumer at will, and another valve, just inside the cellar wall, permits the householder to control the house supply from that point also. The water meter, if employed,

water going to the tanks when full; also with overflow or waste pipes.

Fixtures. The various faucets, sinks, and other similar appliances connected with a plumbing system are called fixtures. Faucets, cocks, or valves are provided at each place where water is to be drawn. (See **VALVES.**) It is important that these should be of high grade, to prevent leakage. Sinks are provided in the kitchen, the butler's pantry, and, in large houses and semipublic and public buildings, in various other places. Most commonly they are of iron and have hot and cold water. Laundry tubs are placed in a separate room or in the kitchen, and consist of two or more rectangular compartments, with the front side sloping, provided with hot and cold water and composed of soapstone, artificial stone, cement, iron, earthenware, porce-

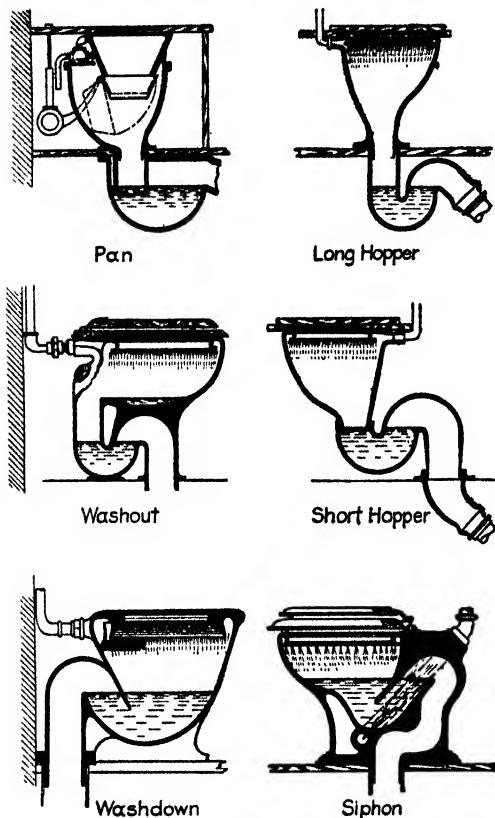


WATER SUPPLY AND DRAINAGE OF A DWELLING.

is generally placed just inside the latter shut-off valve. Except in the smaller and cheaper houses the water piping is mostly in duplicate, one set of pipes being for hot and one for cold water. The water is heated by circulating through a pipe or a water back at the rear of the kitchen range, from which it goes for storage to the kitchen or range boiler. Where large supplies of hot water are used a separate heater fired either by coal or gas may be employed, and in the latter case the burner is regulated automatically. These hot-water boilers are made of wrought iron, steel, or copper, with riveted joints, and should be tested to withstand a high pressure. When the water supply is liable to be inadequate at times, or when the direct pressure is too heavy for safety to the plumbing, a tank is provided in the upper part of the building, and in a skyscraper there may be several sets of these tanks at different elevations. Tanks for the fire lines are often required for large buildings. Great care is necessary to secure and maintain water-tightness. Tanks must be provided with automatic valves to insure a constant supply therein and to prevent

lain, or other material, with or without hinged wooden covers. The chief essential in the material for laundry tubs is lack of porosity, on which account wood, with its high absorbing quality, is unsuitable. Set washbowls are provided in bathrooms and lavatories, in the private rooms of hotels, and sometimes in the sleeping rooms of private dwellings. At one time they were most commonly of marble, but cast iron and steel, both painted and enameled, and porcelain are now more generally employed. Bathtubs, once generally constructed of polished sheet copper, formed on wood, or of solid copper, are now made of enameled cast iron and of porcelain. Shower baths, sitz baths, and foot baths are for the special purposes indicated and are made of different designs and materials. Water-closets, so called because matter deposited into them is flushed out by a discharge of water, are most commonly of glazed earthenware, although in cheap work cast iron is sometimes used. The old-fashioned pan water-closet was one of the most unsanitary of all plumbing fixtures. It consisted of a metal pan, hinged so as to drop downward and discharge its contents into the

pipe with which it was connected. The valve and plunger closets, operated as indicated by their names, were but little better, and are also out of date. Most of the approved forms of water-closets now in use depend for their action upon the sudden discharge of a few gallons

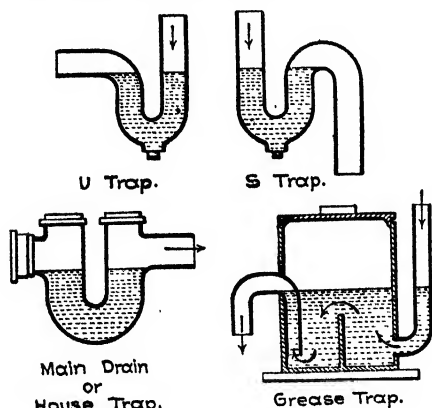


TYPES OF WATER-CLOSETS.

of water, generally from a tank located above the closet. The discharge is usually effected by pulling a hanging chain attached to a lever and valve. In the case of closets in public places the tanks may discharge automatically. Recently, however, attachments have been introduced for flushing water-closets without the use of a tank, the water supply being controlled by a valve operated by a short lever, near the closet seat. In either case the water thus liberated displaces the water previously standing in the bowl or hopper of the closet or else sets it in motion by siphonic action, carrying the wastes with it. By this means the closet is kept fairly clean, particularly the most exposed portions, and the parts not thoroughly clean are always wet. There is an almost endless variety of closets. Some of the most approved patterns are shown in section by the accompanying illustrations. Water-closet flush tanks are generally of wood, lined with copper and provided with a float valve, a water supply, and a flush pipe. Urinals are provided in public places and consist of either bowls or vertical slabs of nonporous material inclosed in stalls and provided with flushing water. Latrines are a series of water-closet stalls connected with a long trough or common flushing chamber be-

low. They are employed chiefly for barracks and institutions. Sill or hose cocks are faucets or valves, with a provision for attaching hose, provided at convenient points for sprinkling lawns and washing sidewalks.

House Sewerage or Drainage. This includes everything required to remove fouled water from the house to the sewer. The pipes from each separate fixture are known as waste pipes; they run to one or more soil pipes, the soil pipe being the vertical run of pipe from the highest fixture to the cellar; the house drain extends from the foot of the soil to a point near the cellar wall, and the house sewer from the latter point to the street sewer. Waste pipes, particularly short runs from washbowls and minor fixtures, may be of lead, but, generally speaking, cast or wrought iron is preferable for important wastes. All soil pipes and the house drain also should be of cast iron. Heavy pipe should be used throughout. The house sewer should be of extra heavy iron through and a short distance beyond the foundation, after which vitrified clay is permissible. All soil and waste pipes should be carried up through the roof. Traps are placed below each fixture and a main trap is generally set just inside the cellar wall. All main traps should have fresh-air inlets or a pipe extending from the inner end of the trap to the outer air. This provides for a circulation of air through the house drain and soil pipe. An increasing number of sanitary engineers favor the omission of the main trap, thus insuring a thorough ventilation of the house and street sewerage system through the numerous soil pipes at one extremity and the street manholes at the other. The object of a trap is to prevent foul air from the house or street sewerage system from entering the house. To this end the simplest and most common practice is to form a water seal by making a bend in the pipe shaped like the letter U or like the letter S, the former being called a U trap and the latter an S trap. Bell traps are formed by inverting a bell or cup over the upper and open end of a pipe, the whole being so adjusted that the edge of the pipe is always submerged. Grease traps may be described as enlargements on waste pipes to retain grease instead of allowing it to pass



TYPES OF TRAPS.

on and clog the sewers. They are most commonly used on the water or drain pipes of large kitchens. Vent pipes were formerly run from the back of each trap to a connection with the

outer air, to give a back air pressure on the trap and lessen the danger from siphonage. Obviously such a pipe from every trap greatly complicates a plumbing system, and trap vents are now omitted on much of the best work in the United States. Regarding the omission of both main traps and trap vents it should be said that there is little need for them on well designed and built house and street sewerage systems, provided that nonsiphoning traps are employed and the disposition of fixtures does not necessitate long branch wastes without the aeration obtained from the vent pipe.

General Considerations. Simplicity, accessibility, a high grade of material throughout, heavy weights for pipes, and good workmanship are the essentials of plumbing. To secure these plumbing should be designed only by the most competent sanitary engineers and should be under the rigid supervision of efficient municipal inspectors. All plans for plumbing should be filed with the plumbing inspector or health department. The hydraulic-pressure test should be applied when the rough plumbing has been completed, and the smoke or peppermint test when the fixtures are set.

Bibliography. C. V. Chapin, *Municipal Sanitation in the United States* (Providence, 1901), valuable on account of its extracts and summaries based on plumbing ordinances, J. J. Lawler, *Modern Plumbing, Steam and Hot Water Heating* (15th ed., New York, 1909); W. P. Gerhard, *The Sanitation, Water Supply, and Sewage Disposal of County Houses* (ib., 1909); id., *House Drainage and Sanitary Plumbing* (3th ed., ib., 1909); id., *Water Supply, Sewerage, and Plumbing of Modern City Buildings* (ib., 1910); R. M. Starbuck, *Standard Practical Plumbing* (ib., 1910); William Hutton, *Country Plumbing Practice* (ib., 1914); W. P. Gerhard, *Sanitary Engineering of Buildings* (ib., 1915); Davis and Dye, *Complete and Practical Treatise on Plumbing and Sanitation* (2 vols., ib., 1915); R. M. Starbuck, *Modern Plumbing Illustrated* (3d ed., ib., 1915). See GAS; HEATING AND VENTILATION; SEWERAGE; WATER WORKS.

PLUMB LINE, DEFLECTION OF THE. See DEFLECTION OF THE PLUMB LINE

PLUM CURCULIO. A weevil (*Conotrachelus nenuphar*) especially injurious to the plum. See PLUM INSECTS

PLUMED KNIGHT. A nickname of James G. Blaine, first given by Col. Robert G. Ingersoll in 1876 in nominating Blaine for the chairmanship of the Republican convention.

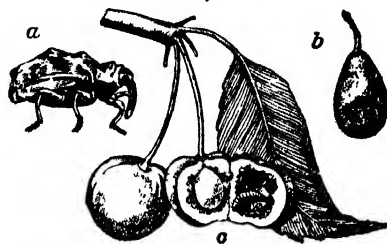
PLUME MOTH. A moth of the family Pterophoridae, a group of wide distribution and probably numerous in species, but the insects are very small and very delicate and are seldom collected. The wings are usually divided after the fashion of a hand into fingers, so as to form feathers. The hind wings are more completely divided than the front, which sometimes are not parted more than once or twice. There is much variety in the habits of the larvæ and pupæ; some are covered with hair and live exposed upon leaves, and some have hairy pupæ, while in some cases there is a slight cocoon. Some larvæ are curiously armed and protectively colored. About 65 species are known in the United States. One of the commonest forms (*Oxyptilus periscelidauctylus*) is yellowish brown in color. The larvæ hatch in the spring and feed upon the leaves of the grape, of which they fasten several together. The caterpillars

live either singly or in companies of two or three in such habitations, changing to pupæ early in June.

The species of the family Orneodidae are also included in the term "plume moth," since the wings are divided as in the Pterophoridae, but much more greatly divided, each wing being split into six plumes. Only one species (*Orneodes hexadactyla*) occurs in the United States, and it is found also in Europe and Canada.

PLUMIER, plu'myá', CHARLES (1646-1704). A French botanist, born at Marseilles. He studied botany under the celebrated Joseph de Tournefort (q.v.), and in 1689 visited the West Indies. On his return he published *Description des plantes de l'Amérique*, with numerous plates (1693). At the King's request he twice again visited North America, in 1693 and 1695. In 1703 appeared his *Nova Plantarum Americanarum Genera*. When about to sail the fourth time for America, in order to investigate the subject of Peruvian bark (cinchona), he died at Cadiz. A work that is still often consulted is his treatise on the ferns of America, which appeared in the year after his death. It contains 172 engraved plates. He wrote extensively in miscellaneous publications on the plants, birds, and fishes of America. A genus of South American plants, *Plumeria* (Apocynaceæ), several species of which are cultivated for the fragrance of their flowers, was named by Tournefort in his honor. Consult Albrecht von Haller, *Bibliotheca Botanica* (Göttingen, 1771).

PLUM INSECTS. The most notable of the insects which damage the plum in the United States is the plum curculio (*Conotrachelus nenuphar*), a species which for many years has destroyed almost the entire crop over large sections of the country. It is a small, rough, grayish or blackish beetle, about one-fifth of an inch long, with a black, shining hump on the middle of each wing case. The female lays her eggs in the young fruit shortly after it is formed, making with her long snout a small cut through the skin, running in the snout to a depth of about one-sixteenth of an inch. In this cavity the egg is placed. She then cuts a crescent-shaped slit through the skin in front of the hole so as to undermine the egg and leave it in a flap, the object being apparently to cause the piece around the egg to wilt and thus to prevent the growing fruit from crushing the egg. The larva is a white,



PLUM CURCULIO (*Conotrachelus nenuphar*) AND ITS WORK. a, adult beetle, b, a young plum attacked by the larva; c, cherry affected by the larva.

footless grub which feeds upon the flesh of the fruit, for the most part about the stone. It reaches full growth in from three to five weeks. The fruit meantime has become diseased and has fallen prematurely to the ground. The larva

leaves the fallen fruit, enters the ground to a depth of from 4 to 6 inches, and transforms to pupa in an earthen cell, issuing in from three to six weeks in the adult condition. The insect is single-brooded and hibernates as an adult. The beetles emerge from hibernation when the trees are about to blossom, feed for some time by puncturing the twigs and buds, and lay their eggs in the fruit soon after it is formed. The best remedies consist in spraying the trees with an arsenical mixture during the feeding time of the beetles, and afterward in jarring them, causing the beetles to fall from the branches, when they are caught in cloth receptacles and destroyed. This jarring method is carried on with great success in some of the largest orchards in the country.

Very few other insects are specifically connected with the plum. The larva of one of the sphinx moths (*Sphinx drupiferarum*) feeds upon the foliage, and a number of other species are found more or less abundantly eating the leaves. None of them, however, are ever sufficiently abundant to cause marked damage. As mentioned under PEACH INSECTS, the peach-tree borer sometimes attacks the trunks of plum trees. Another weevil occasionally damages the fruit, and this species, the plum gouger (*Cocotorus scutellaris*), is especially abundant in parts of the West. It appears in the spring, about the same time as the plum curculio, but, instead of cutting a crescent-shaped flap, bores a round hole in the fruit like the puncture of a pin. The larva, instead of feeding around the stone of the fruit, works its way through the soft shell of the stone and feeds upon the kernel.

Consult Slingerland and Crosby, *Manual of Fruit Insects* (New York, 1914).

PLUMMER, ALFRED (1841-). An English biblical scholar, born at Heworth, Durham. He was educated at Exeter College, Oxford, was a fellow of Trinity (1865-75) and tutor and dean (1867-74), and then was master of University College, Durham, until 1902, being subwarden of the University of Durham in 1896-1902. He translated several of Döllinger's works and was one of the translators of Von Ranke's *History of England*. Plummer was one of the editors of the valuable *International Critical Commentary* on the Bible and he wrote much for it and other similar series. He published also: *A Handbook on the Church and the Early Fathers* (1887); three volumes of *Lectures on English Church History* (1904-06); *The Church of England in the Eighteenth Century* (1910); *The Churches in Britain before A.D. 1000* (1911); *The Continental Reformation in Germany, France, and Switzerland from the Birth of Luther to the Death of Calvin* (1912); *The Humanity of Christ and Other Sermons* (1913).

PLUMMER, MARY WRIGHT (1856-1916). An American librarian. She was born at Richmond, Ind., was a special student at Wellesley (1881-82) and at Columbia (1887-88), served as librarian of the Pratt Institute Free Library, Brooklyn (1896-1904), and as director of the institute's Library School (1896-1911), and thereafter was principal of the Library School of the New York Public Library. In 1915 the American Library Association elected her its president. Besides contributions to periodicals Miss Plummer published: *Hints to Small Libraries* (1894; 4th ed., 1911); *Verses* (1896); *Contemporary Spain* (1899); *Roy and Ray in Mexico* (1907); *Roy and Ray in Canada*

(1908); *Stories from the Chronicle of the Old* (1910).

PLUM POCKET. See ASCOMYCETES; **PLUM. PLUMPTRE**, plūm'trē, EDWARD HAYES (1821-91). An English clergyman, theologian, and author. He was born in London, Aug. 6, 1821, was educated at University College, Oxford, and became fellow of Brasenose in 1844. Subsequently he was chaplain of King's College, London (1847-68); professor of pastoral theology there (1853-63) and professor of New Testament exegesis (1864-81); assistant preacher at Lincoln's Inn (1851-58) and prebendary of St. Paul's (1863-81). In 1866 he also served as Boyle lecturer, in 1869 became rector of Pluckley, and in 1873 vicar of Bickley. He was one of the Old Testament company of revisers appointed by Convocation (1869-74). He became dean of Wells in 1881 and it was there he died, Feb. 1, 1891. Besides volumes of verses, *Lazarus and Other Poems* (1864), *Master and Scholar* (1866), *Things New and Old* (1884), he published poetical translations of Sophocles (1865), *Æschylus* (1868), and of Dante's *Divina commedia* and *Canzoniere* (1886-87), the latter particularly helpful in its notes. In prose, besides commentaries and contributions to various dictionaries, and periodicals, he wrote: *Christ and Christendom* (1867); *Biblical Studies* (1870); *Movements in Religious Thought: Romanism, Protestantism, and Agnosticism* (1879); *The Spirits in Prison* (1884); *Life and Letters of Bishop Ken* (1888); *Wells Cathedral and its Deans* (1888).

PLUNK'ET, WILLIAM CONYNNGHAM, first BARON (1765-1854). A British advocate, orator, and statesman, born at Enniskillen, Ireland. He graduated at Dublin University in 1784, studied law in London, was called to the bar in Ireland (1787), and was made king's counsel 10 years later. He sat in the Irish Parliament for the last two years of its existence (1799-1800), and was denounced as a renegade when he became Solicitor-General (1803). He was appointed Attorney-General for Ireland in Pitt's government (1805); was elected in 1807, and sat again in 1812-22, in the British House of Commons, where he made his mark as the most eloquent Protestant pleader for Catholic emancipation. Once more Attorney-General for Ireland (1822), he became a peer and Chief Justice (1827) and was Lord Chancellor of Ireland from 1830 until 1841, when he retired. Consult the memoir by F. Douglass How (New York, 1901).

PLUNKETT, SIR HORACE CURZON (1854-). An Irish statesman, son of the sixteenth Baron Dunsany. He was educated at Eton and at University College, Oxford. He lived on a ranch in Montana from 1879 to 1889. Soon after his return to Ireland he founded (1894) the Irish Agricultural Organization Society and formed (1895) the Recess Committee, whose report (1896) on agricultural needs and suggested legislation he drafted. In 1892-1900 he was a Unionist member of Parliament, in 1897 became a member of the Irish Privy Council, and in 1899-1907 was vice president of the department of agriculture and technical instruction in Ireland, which had grown from the recommendations of his Recess Committee. He held this office even after he lost his seat in Parliament, and when the Liberals came into power in 1906 was retained by Bryce until Nationalist opposition to him grew too strong. He then re-

signed and government support to the valuable work done by his Irish Agricultural Organization Society (the I. A. O. S.) was withdrawn. He had been knighted in 1903. In 1911 at the All Ireland Model Election of the Proportional Representation Society of Ireland he was returned with John Redmond and Sir Edward Carson at the head of the poll. Early in 1914 he visited Ulster and attempted to bring about peace, and in February suggested that after a term of years a part of Ulster might vote whether it would secede from Home Rule Ireland. Later in the year he came out for Home Rule. He wrote several pamphlets on agricultural, especially dairy, coöperation in Ireland, *Ireland in the New Century* (1904, rev., 1905; in Italian, 1914), which particularly irritated the Nationalists, *Noblesse Oblige: An Irish Rendering* (1908), *The Rural Life Problem in the United States* (1910); *A Better Way: An Appeal to Ulster not to Desert Ireland* (1914). Consult Sydney Brooks, "Sir Horace Plunkett and his Work," *Fortnightly Review* (London, June, 1912)

PLU'RALISM (from *plural*, OF. *plurel*, Fr. *plurel*, from Lat. *pluralis*, relating to many, from *plus*, OLat. *pleor*, more, connected with Gk. *πλεον*, *pleion*, more, *πολύς*, *polys*, much, many, Skt. *puru*, OPers. *paru*, OIr. *ul*, Goth. *UIIG*, *filu*, Ger. *viel*, AS. *fedu*, archaic Eng. *fecl*, many, and ultimately with Eng. *full*) In canon law, the possession by the same person of two or more ecclesiastical offices, whether of dignity or of emolument. Pluralism has been held unlawful from the earliest times, and is forbidden by many ancient councils, as Chalcedon (451) and the second of Nicæa (787), on the ground of the impossibility, in ordinary cases, of the same individual adequately discharging the duties of more than one office. The rule by which dispensations from the law of residence are to be regulated, as well as the penalties for its violation, whether on the part of the patron or on that of the recipient, have formed the subject of frequent legislation. In general it may be said that the canon law regards as incompatible (1) two benefices each having the cure of souls, (2) two dignities, (3) a dignity and a cure of souls, (4) a cure of souls and a simple benefice requiring residence. In other cases than these the Pope is held to have the power of dispensing. Although a constant effort was made to prevent abuse, the evasions of the law were formerly frequent, especially for noble or learned persons, but now are very rare in the Roman Catholic church. The English law before the Reformation in the main coincided with the canon law, and the legislation of Henry VIII preserved the same general spirit, only substituting the dispensing power of the crown for that of the Pope. The practice is forbidden by the Pluralities Act of 1838, amended in 1850 and 1885, except that dispensations may be granted in case the churches are not more than 4 miles apart and the living of one not more than £200. Consult J. F. von Schulte, *Lehrbuch des katholischen und evangelischen Kirchenrechts* (Giessen, 1886); for England, *The Statutes Revised*, vol. viii (London, 1894)

PLURALISM. In philosophy, a term used to designate any theory that states the universe in terms of more than one ultimate principle. Its antonym is monism (q.v.), when used in the stricter sense. The prevailing tendency of rationalistic or intellectualistic philosophy is

towards monism, while empiricism leans always towards pluralism. Of recent years pluralism has been vigorously championed by William James (q.v.). Consult William James, *A Pluralistic Universe* (New York, 1909).

PLUSH (Fr. *pluche*, *peluche*, plush, shag, from Lat. *pilus*, hair). A variety of woven cloth, having a long shaggy pile on the upper surface. Although woven like velvet, it differs from it in the greater length of the pile and in its not being clipped or shorn to a uniform length. Formerly it was made of a double warp, one thread being usually double worsted yarn, the other, intended to form the pile, of goat's hair, and the filling of worsted; occasionally only worsted was used. Now it is made very extensively of silk and cotton, the silk taking the place of the goat's hair to form the pile. Recently the tussah silk, a wild silk of India, has been extensively used in the manufacture of plush. See **WEAVING**.

PLU'TARCH (Gk. Πλούταρχος, *Ploutarchos*) (c. 46-c. 125 A.D.). An encyclopædic writer and a charming type of the Greek gentleman and scholar of Roman times. He was born at Chæronea in Boeotia, the country of Hesiod and Pindar, to whom he often alludes. His writings introduce us to a pleasant circle of kinsmen and friends, his grandfather Lamprias, his father, brother, and four sons, his wife Timoxena, to whom he addresses a beautiful "consolation" on the death of their little daughter, his Roman friends Sossius Senecio, Metrius Florus, and Junius Arulenus Rusticus. His biography must be collected from his works. He was a student at Athens at the time of Nero's visit to Greece (66 A.D.). Later he traveled in Greece, Egypt, and Italy. He visited Rome more than once and remained there for some time in the reign of Vespasian, enjoying the friendship of prominent men, lecturing on moral philosophy, and gathering the materials for his historical works. Real mastery of the Latin language and genuine insight into Roman institutions, however, he never attained. He established himself for the last years of his life at Chæronea, paying frequent visits to Athens and to Delphi, where he exercised priestly functions. At Chæronea he held the office of archon and that of building inspector, recording his experiences perhaps in the treatise on the precepts of government and the essay on the question whether an old man ought to take part in politics. Greek moral philosophy being at that time the best substitute for religion, he became to many friends and young people a guide, philosopher, spiritual director, and physician of the soul, a rôle which a generation earlier Seneca, the Stoic philosopher (q.v.), had assumed with more self-consciousness and display at Rome. He recalled old memories of Rome and Athens in his "table talk." He wrote out his old lectures and gave new ones to the young people of an informal school that gathered about him. He composed dialogues in the manner of Cicero rather than of Plato. He continued his historical studies and published his parallel *Lives* of Greeks and Romans. These, the best known of his writings, have been called "the food of great souls" because of their power to kindle emulation in youth and the enormous influence which, through Jacques Amyot (q.v.), Montaigne, and Shakespeare, they have exercised upon modern literature. Forty-six of them are extant, arranged in 22 sets. They cover all classical antiquity

from Theseus-Romulus and Lysurgus-Numa to Demosthenes-Cicero and Alexander-Cæsar. They were not composed in the order of chronology or of their present arrangement. There are in addition four single biographies. The formal comparisons that follow most of the pairs are often somewhat forced. They stirred Shakespeare's sense of humor and provoked the delightful parody of Captain Fluellen's comparison of King Henry to Alexander on the basis of the resemblance of Macedon to Monmouth. (Consult *King Henry the Fifth*.) They may be spurious, as the comparison was a recognized form of rhetorical exercise. The *Lives* are avowedly character sketches with a moral rather than severe historical studies, but they belong to the small category of the world's books which are read by all educated men, not merely consulted by scholars, and whose influence spreads in ever-widening circles. Our knowledge of antiquity owes more to Plutarch than to any other one writer, and in the loss of his sources it is hardly necessary to add that the *Lives* become our primary authority for countless facts of history.

Hardly less interesting, though less known than the *Lives*, are the multifarious discursive or didactic essays and dialogues (some of them spurious) grouped under the title of *Moralia*. These comprise the nine books of Table Talk or Symposiaca, a curious illustration of the playful pedantry that was accounted good conversation in later Græco-Roman cultured circles; edifying moral disquisitions enlivened by anecdote and quotation on such topics as "How a Young Man Ought to Read Poetry," "How to Distinguish a Flatterer from a Friend," "On Exile," "On Superstition," "Rules for the Care of the Health," "Advice to the Married," etc.; more elaborate essays or dialogues on religious or philosophical topics—"The Banquet of the Seven Wise Men," "On Isis and Osiris," a chief source of our knowledge of Egyptian religion, "On the Failure of the Oracles," "On the Genius of Socrates," "On the Contradictions of the Stoics," "On the Creation of the World Soul in Plato's *Timæus*." Plutarch's intimate knowledge of Plato lends a certain unity and seriousness of tone to all this discursive literary productivity. He was widely read also in the literature of the Stoics and the Epicureans, but he refers to them mainly to refute them when they diverged from Plato.

Plutarch's style is that of an intelligent, widely read man, familiar with the vocabulary of philosophy and the sciences and more concerned for his matter than his manner. He does not affect Attic purism, and the tawdry rhetoric of his age has no attractions for him. He died somewhere between 120 and 130 A.D.

Bibliography. The entire text may be found in the *Teubner Series* and also in the *Didot Bibliotheca* (with Latin translation). Wyttenebach's unfinished 16-volume edition of the *Moralia* with *Index Græcitatibus* (Oxford, 1795-1830) is indispensable to the student. Gréard, *De la morale de Plutarque* (Paris, 1866), is a readable study. Volkmann, *Leben, Schriften und Philosophie des Plutarch* (Berlin, 1873), is scholarly and exhaustive. See also R. C. Trench, *A Popular Introduction to Plutarch* (London, 1873); Friedrich Leo, *Die griechisch-römische Biographie* (Leipzig, 1901); John Oakesmith, *The Religion of Plutarch as Expounded in his Ethica* (New York, 1903); Theodor Mommsen,

History of Rome, vol. v (trans. by W. P. Dickson, new ed., ib., 1905); G. D. Hadzsits, "Prolegomena to a Study of the Ethical Ideal of Plutarch and the Greeks of the First Century, A.D.," in *University of Cincinnati Studies*, vol. ii (2d series, Cincinnati, 1906); W. C. Wright, *A Short History of Greek Literature* (New York, 1907); Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (5th ed., Munich, 1911); and the article "Plutarchus," in Fr. Lübker, *Reallexikon des klassischen Altertums*, vol. ii (8th ed., Leipzig, 1914). The translation of the *Lives* revised by A. H. Clough (5 vols., New York, 1909) is a standard. For other translations of parts of the *Lives*, see PERRIN, BEHNADOTTE. North's version from the French of Amyot (q.v.), made in 1579, was reëdited by G. Wyndham in 1895. The *Moralia* may be read in the traditional translation revised by W. W. Goodwin (Boston, 1874-78).

PLUTEUS, plútê-ûs (Lat., parapet, partition, penthouse). In classical and early mediæval architecture, a section of a parapet or a slab filling up the space between two columns; an inclosure around an altar or other low screen.

PLUTO (Lat., from Gk. Πλούτων, *Ploutôn*, from πλοῦτος, *ploutos*, wealth). The Roman name for the Greek god of the lower world, properly called Hades. Two conceptions may be distinguished. One chiefly prominent in poetry represents him as the grim and implacable ruler beneath the earth, an enemy of all life, invisible, terrible, not to be appeased by sacrifice or prayer. His kingdom, though provided with palace and all else that belong to his state, is gloomy and full of horrors, while from it none ever escapes. The other conception seems to be found rather in some aspects of his cult and in popular belief. It is best expressed through his name Pluto, Giver of Wealth, and considers the ruler of the lower world as the owner and bestower of the products which are hidden in his kingdom, especially of the grain. This aspect seems prominent in the cult of Eleusis (q.v.), and it is significant that the name Pluto first occurs in Attic poets of the fifth century B.C. Naturally Hades is not prominent in the myths. He was considered a son of Cronos and brother of Zeus and Poseidon, to whom the depths of the earth and the kingdom of the dead were assigned after the overthrow of the Titans (q.v.). From the Cyclops he received his cap of invisibility, which belongs to him as the thunderbolt belongs to Zeus and the trident to Poseidon. In his chariot he suddenly burst from the earth and carried off Persephone (see CERES), who became his queen and regularly shared his cult. It should be noted, however, that this cult has to do with Pluto and with the milder aspect of the god. So far as can be seen, only at Pylas in Elis was there a sanctuary of Hades. This was opened only once a year, and then could be entered only by the priest. (See also HIERAPOLIS, I.) In art Hades is not a frequent figure, and no distinct type was developed to distinguish him. In general he differs from Zeus only in his expression, which is dark and stern; his hair hangs heavily over his brows. He is also fully and even heavily draped. In such scenes as the rape of Persephone modifications appear, and sometimes a wolf's-head helmet seems to represent the cap of invisibility.

In Rome the worship of Dis Pater and Proser-

pina was introduced in 249 B.C. in consequence of various omens, and games were held on three nights in the Campus Martius, accompanied by the sacrifice of black cattle. These games, according to the vow, were repeated in 146 B.C. and later were modified by Augustus. The place where the sacrifices were offered was called Tarantum, and the altar was 20 feet below the level of the ground and exposed to view only on the occasions of the sacrifices. Proserpina (q.v.) may have been an Italian goddess, but this joint cult is certainly of purely Greek origin and almost certainly borrowed from Tarantum. Consult: Otto Gruppe, *Griechische Mythologie und Religionsgeschichte* (2 vols., Munich, 1906); L. R. Farnell, *The Cults of the Greek States*, vol. iii (Oxford, 1907); C. M. Gayley, *The Classic Myths in English Literature and in Art* (2d ed., Boston, 1911); Georg Wissowa, *Religion und Kultus der Römer* (2d ed., Munich, 1912).

PLUTO MONKEY. A West African monkey (*Lasiopyga*, or *Cercopithecus*, *pluto*), one of the guenons of Angola, which is distinguished by the reddish-black color of the underparts and generally dark fur. The forehead of this species has a white band and the cheeks bear bushy gray whiskers.

PLUTONIC ROCKS (from Lat. *Pluto*, god of the lower world). The name given to those igneous rocks which have consolidated at considerable depths in the earth and have subsequently been brought to the surface by the denudation and removal of the overlying strata. As a class they are contrasted with the volcanic rocks which have solidified at or near the surface. Most of the coarse-grained igneous rocks, especially granites, are of plutonic origin. See IGNEOUS ROCKS.

PLUTONIUM. See HIERAPOLIS, 1.

PLUTUS (Lat., from Gk. Πλούτος, *Ploutos*, from πλούτος, *ploutos*, wealth). In Greek mythology, the god of riches, son of Demeter and Iasion. According to the legend, Zeus blinded him that he might not be able to discriminate in his gifts, and in the *Plutus* of Aristophanes he appears as a blind old man. In art, however, he was usually represented as a child, and in the arms of some goddess, such as Tyche (Fortune), or Athena Ergane (the Worker), or Eirene (Peace).

PLUVIOSE, plu'v'ë'öz' (Fr., rainy). The name given to the fifth month of the French Republican calendar, beginning on January 20, 21, or 22 and ending on February 19, 20, or 21.

PLUVIUS. An epithet of Jupiter (q.v.) as the giver of rain.

PLYM'LEY, PETER. An assumed name under which Sydney Smith published a series of vigorous letters in defense of Catholic emancipation (1807-08).

PLYMOUTH, plim'úth. An important seaport, parliamentary and county borough, in the southwest of Devonshire, England, 200 miles (direct) west-southwest of London (Map: England, B 6). It stands in the Bight of Plymouth Sound between the estuaries of the Plym and Tamar. To the west is East Stonehouse, a township and coastguard station, and still farther west is Devonport (q.v.), the great naval and military station. United by continuous lines of houses, they form an aggregation known as the Three Towns, which constitutes one of the most important ports in England. Plymouth proper may be called the city and Devonport the west

end, while East Stonehouse is an intermediate district, containing chiefly factories, barracks, victualing yards, hospitals, and other institutions. Plymouth extends from Mill Bay on the west to the mouth of the Plym on the east. Its site is somewhat rugged and uneven; an eminence forming the suburbs runs along its northern side, and another eminence, partly occupied by the citadel, fronts the Sound. The chief buildings are the Royal Hotel, comprising an immense inn, assembly rooms, a theatre, and the athensium; the public library, containing in its Cottonian collection 300 sketches by the old Italian masters; St. Andrew's Church, the tower of which dates from 1490 (the church was restored in 1874); and Charles Church (1646-58), dedicated to St. Charles the Martyr. There are several important educational establishments, some of which are endowed, and many charitable institutions. The guildhall and municipal buildings form a handsome Gothic group. The city contains an arsenal, a dockyard, and other government buildings, and a marine biological laboratory. Mill Bay and Sutton Pool are small inlets of the Sound, in which lie the merchant vessels bound for Plymouth proper. Between these inlets, and running along the shore, is the eminence called the Hoe, embellished with interesting monuments. From this ridge, whence the approach of the Spanish Armada is said to have been first descried, magnificent shore and sea views may be obtained. Its eastern end is occupied by the citadel, which commands the entrance of the Cutwater (the lower estuary of the Plym) and of Sutton Pool. Mill Bay on the west is so deep that vessels of 3000 tons can lie at the pier at low water. The principal industries are shipbuilding and fisheries; the manufactures are unimportant, the chief being chemicals; but as a naval station, the centre of the Devonshire and Cornwall trade, and as a holiday and health resort, Plymouth holds a prominent position. It carries on a considerable foreign trade. It has fine docks, harbors, and extensive quayage, and a breakwater completed in 1841 protects the Sound with its spacious inner anchorage. The principal exports are lead, tin, copper, and granite; imports, agricultural products and timber. Plymouth was the first English town incorporated by Act of Parliament, its charter dating from Nov. 12, 1439. It owns the oldest municipal water works in England, originated in 1585 by Sir Francis Drake, the navigator, then mayor of the town. It owns also profitable real estate, the Royal Hotel, already mentioned, abattoirs, markets, a refuse destructor, the heat of which is utilized to generate electric light and power, electric tramways, suburban artisans' dwellings connected by tramways which carry workmen for a penny, baths, and washhouses, and maintains free libraries, a technical school, museum and art gallery, the Hoe Park and pleasure grounds, hospitals, and a lunatic asylum. The population of the Three Towns in 1901 was 193,184, having tripled since 1821; in 1911, 207,446, that of Plymouth proper was 107,636 in 1901 and 112,030 in 1911. The area of the Three Towns, in land and water, is 5719 acres; of Plymouth, 3152 acres.

Plymouth, described by Leland as being, in the reign of Henry II, "a mene thing, an inhabitation of fishers," was called by the Saxons Tame-worworth (town on the Tamar); after the Conquest it was called Sutton (south town); and

it was not till the reign of Henry VI that it received the name of Plymouth (mouth of the Plym). During the fourteenth and fifteenth centuries it was frequently attacked and set on fire by the French, and in 1512 an Act was passed for the strengthening of its defenses, which since then have been greatly increased, until now the entire shore of the Sound is well defended by cannon, while a cordon of inland forts, constructed at immense cost, surrounds the Three Towns at a distance of from 2 to 3 miles. Plymouth witnessed the departure of Drake's noted expedition to circumnavigate the world in the reign of Elizabeth, and her fleet went forth from here to encounter the Spanish Armada. The Pilgrims on board the *Mayflower* set sail for America from Plymouth on Sept. 6, 1620. During the Cromwellian War the town successfully sustained a siege of four years for the Parliamentary cause; it was the first large town to proclaim William of Orange King of England. Consult R. N. Worth, *History of Plymouth, from the Earliest Period to the Present Time* (Plymouth, 1871), and F. M. Williams, *Plymouth* (ib., 1898).

PLYMOUTH. A town in Litchfield Co., Conn., 10 miles north of Waterbury, on the New York, New Haven, and Hartford Railroad (Map: Connecticut, C 3). It has saw mills, granite works, etc. Pop., 1900, 2828, 1910, 5021.

PLYMOUTH. A city and the county seat of Marshall Co., Ind., 84 miles east-southeast of Chicago, on the Lake Erie and Western, the Pennsylvania, and the Vandalia railroads (Map: Indiana, E 2). It is a commercial centre and residential place, with manufactures of baskets, barrels, binder slats, emery, grinders, and novelties. Among the noteworthy features are the Julia E. Work Training School, St. Michael's Academy, Plymouth Sanitarium, and the public library. The water works are owned by the city. Settled in 1835, Plymouth was incorporated in 1852. Pop., 1910, 3838.

PLYMOUTH. A town, port of entry, ranking in foreign imports in the State next to Boston, the county seat of Plymouth Co., Mass., situated 37 miles southeast of Boston, on the New York, New Haven, and Hartford Railroad, and extending for 18 miles along Plymouth harbor, an arm of Massachusetts Bay (Map: Massachusetts, F 5). It is the oldest town in New England, having been the landing place of the Mayflower Pilgrims, who made it the first permanent English colony north of Virginia. Among the features of interest are Plymouth Rock, now covered by an open granite structure; Burial Hill and Cole's Hill, where many early settlers were buried; Leyden Street, on which the first Pilgrim houses were built; Pilgrim Hall, with its collection of paintings and relics; and the National Monument to the Pilgrims, dedicated in 1889. The statue of "Faith," 36 feet in height, is mounted on a granite base 45 feet high, surrounded by four large buttresses on which are massive monolithic figures of "Morality," "Law," "Education," and "Freedom." Other notable structures are the Federal Building (including post office and custom-house), the Russell Public Library, Jordan Hospital, and the public-school buildings. There are also a beautiful forest park of 200 acres and a municipally owned water-supply system. Plymouth is a well-known summer resort, attracting more than 100,000 visitors annually,

and is of considerable commercial and industrial importance. The principal manufactures include cordage and wheat-binder twine, tacks, rivets, woolen goods, stoves, foundry products, rubber goods, insulated wire, electrical zinc manufactures, etc. Pop., 1900, 9592; 1910, 12,141, 1914 (U. S. est.), 13,227.

Bibliography. Francis Baylies, *An Historical Memoir of the Colony of New Plymouth* (2 vols., Boston, 1866); W. T. Davis, *History of the Town of Plymouth* (Philadelphia, 1885); J. A. Goodwin, *The Pilgrim Republic* (Boston, 1888); *Records of the Town of Plymouth* (Plymouth, 1889-92), W. R. Bliss, *Old Colony Town and Other Sketches* (Boston, 1893); W. T. Davis, *Ancient Landmarks of Plymouth* (2d ed., ib., 1899), William Bradford, *History of Plymouth Settlement, 1608-1650*, rendered into modern English by Valerian Paget (New York, 1909). See MASSACHUSETTS.

PLYMOUTH. A town and one of the county seats of Grafton Co., N. H., 52 miles by rail north by west of Concord, on the Pemigewasset and Baker rivers and on the Boston and Maine Railroad (Map: New Hampshire, F 5). Situated in a region noted for its scenic attractions, Plymouth is a popular summer resort. It is the seat of the State Normal School and has a public library. The Holderness School for Boys is near by. There are manufactures of shoe pegs, buckskin gloves, sporting goods, lumber, silverware, and wood pulp. Nathaniel Hawthorne died here, and the old courthouse is famous as the scene of Daniel Webster's first appearance as a lawyer. The town owns its water works. Pop., 1900, 1972; 1910, 2200. Consult E. S. Stearns, *History of Plymouth, New Hampshire* (2 vols., Plymouth, 1906).

PLYMOUTH. A town and the county seat of Washington Co., N. C., 162 miles east of Raleigh, on the Roanoke River, near Albemarle Sound, and on the Atlantic Coast Line and the Norfolk and Southern railroads (Map: North Carolina, F 2). It is the trade centre for a fertile region, the chief products of which are cotton, peanuts, tobacco, rice, farm produce, and lumber. There are lumber and veneer mills. Pop., 1900, 1011, 1910, 2165.

PLYMOUTH. A borough in Luzerne Co., Pa., 4 miles west of Wilkesbarre, on the Susquehanna River and on the Delaware, Lackawanna, and Western Railroad (Map: Pennsylvania, K 4). It is interested principally in coal mining and in the coal trade, being situated among the rich anthracite fields of the State. The chief products of its industrial establishments include mining drill machines, miners' squibs, hosiery, silk, lumber products, etc. Plymouth was settled in 1768 by the Susquehanna Company, and until the Pennamite-Yankee War in 1799 was claimed by Connecticut. Coal was first shipped in 1807. Pop., 1900, 13,649, 1910, 16,996; 1914 (U. S. est.), 18,422. Consult Wright, *Historical Sketches of Plymouth, Pennsylvania* (Philadelphia, 1873); French, *Reminiscences of Plymouth* (New York, 1914).

PLYMOUTH. A city in Sheboygan Co., Wis., 14 miles west of Sheboygan, on the Chicago, Milwaukee, and St. Paul and the Chicago and Northwestern railroads (Map: Wisconsin, F 5). It contains a Carnegie library, county fair grounds, and Fountain Park. There are important cheese interests and, among the industrial establishments, large coal-storage plants, flour mill, brewery, and manufactures of furni-

ture, gasoline engines, and feed cutters. The water works and electric-light plant are owned by the city. Pop., 1900, 2257; 1910, 3094.

PLYMOUTH BRETHREN. A religious sect which sprang into existence in the British Isles during the first half of the nineteenth century and has extended itself throughout the British dominions and in certain parts of the continent of Europe, particularly among the Protestants of France, Switzerland, and Italy, and in the United States of America. They do not use the name themselves, preferring to be called simply Believers, Christians, or Brethren. Their origin seems to have been due to a reaction against exclusive High Church principles in the Church of England and similar tendencies in other churches, and against a dead formalism associated with unevangelical doctrine. While several communities appeared almost simultaneously in various places, the foundation of the body is generally ascribed to the labors and influence of John Nelson Darby, from whom on the continent of Europe they are commonly known as Darbyites. Darby was born in London in 1800; he was graduated B.A. at Trinity College, Dublin, in 1819, and was called to the Irish bar in 1825. He withdrew from the Church of Ireland because of the conscientious scruples regarding the scripturalness of Church establishments; he also believed that denominational distinctions and a regular ministry should be discarded. He found others who shared his views, notably Anthony Norris Groves, a student at Trinity College, and an association was formed in Dublin in 1828. Another was soon organized in Plymouth, and the fact that Providence Chapel in that town was the first regular place of meeting gave rise to the name Plymouth Brethren in 1830. Darby continued to labor as an evangelist, unconnected with any church, in England and on the Continent, until his death in 1882. He preached in English, French, and German, wrote voluminously, and edited a quarterly periodical, the *Christian Witness*, which for a number of years was the official organ of the Brethren. His collected writings have been published in 32 volumes (London, 1867-83).

The doctrines of the Plymouth Brethren are Calvinistic. They emphasize original sin, predestination, the efficacy of Christ's sacrifice, and salvation by personal acceptance of the atonement of Christ. Millenarian views are also generally entertained. They practice the baptism of adults without regard to previous infant baptism. They hold meetings for Bible study and prayer, and observe the Lord's Supper weekly on Sunday. Their most distinctive peculiarity is their refusal to recognize any form of Church government or any office of the ministry; they insist on the equal right of every male member of the Church to prophesy or preach. They do not build churches, but meet in halls or private houses. A great schism took place among them during Darby's lifetime because of doctrines preached at Plymouth and Bristol concerning the human nature of Christ, and they have been frequently divided on narrow lines. There are four divisions in the United States. In 1915 there were 403 meetings and 10,566 communicants in the United States. Consult the biographies of eminent members of the sect, as those of A. N. Groves, by his widow (3d ed., London, 1869), and Henry Craik, by Taylor (ib., 1866); the writings of B. W. Newton and W. Kelly; also Dorman, *The Close of Twenty-*

eight Years of Association with J. N. Darby (London, 1866); Henry Groves, *Darbyism: Its Rise and Development* (ib., 1866). For hostile criticism: J. L. C. Carson, *The Heresies of the Plymouth Brethren* (ib., 1862); W. Reid, *The Plymouth Brethren Unveiled and Refuted* (2d ed., Edinburgh, 1874-76); T. Croskery, *Plymouth Brethrenism: A Refutation of its Principles and Doctrines* (London, 1879); A. Miller, *Plymouthism and the Modern Churches* (Toronto, 1900). Consult also: J. S. Teulon, *The History and Teaching of the Plymouth Brethren* (London, 1883); W. B. Neatley, *A History of the Plymouth Brethren* (2d ed., ib., 1902); H. K. Carroll, *Religious Forces in the United States* (New York, 1912).

PLYMOUTH CHURCH. The church in Brooklyn, N. Y., made famous by the long pastorate of Henry Ward Beecher. The society was organized in 1847 and the present structure, seating 1800 persons, was erected in 1849. There have been three pastors: Henry Ward Beecher, 1847-87; Lyman Abbott, 1888-90; and Newell Dwight Hillis, 1899-. The membership in 1915 was upward of 2100.

PLYMOUTH COLONY. See MASSACHUSETTS.

PLYMOUTH COMPANY. A joint-stock organization chartered by King James I in 1606 in conjunction with the London Company to plant colonies in North America, the London Company to plant them between lat. 34° and 38°, the Plymouth Company to plant them between lat. 41° and 45°, and the company that should plant the first colony to have the right subsequently to plant in the territory between lat. 38° and 41°. The Plymouth Company planted a colony in 1607 at the mouth of the Sagadahoc, or Kennebec, River, but this was abandoned the following year, and after repeated failures the company was superseded in 1620 by the Council for New England. See LONDON COMPANY.

PLYMOUTH ROCK. A ledge of rock in Plymouth harbor, Massachusetts, on which the Pilgrims are said to have stepped when disembarking in 1620. A beautiful granite canopy has been erected upon the rock.

PLYMOUTH ROCK. A breed of domestic fowls, popular and numerous throughout the United States, in several varieties. It is of large size and has admirable qualities for market purposes. The favorite variety is the barred, of a grayish-white color, every feather marked with many curving black bands. There are also clear white and clear buff varieties. The standard weight of the cock is 9.50; of hens, 7.50 pounds. See Colored Plate of Fowls, under POULTRY.

PLYMOUTH SOUND. A beautiful inlet of the English Channel between Cornwall and Devonshire, forming the harbor of Plymouth and Devonport, which is an important British naval station (Map: England, B 6). See PLYMOUTH, and the article BREAKWATER.

PLYNLIM'MON, or PLINLIM'MON. A mountain of Wales, on the boundary between the counties of Montgomery and Cardigan, 2481 feet in height. Although only 12 miles from the coast, it is in the midst of a wild waste of moor and bogs. On its slopes are the sources of the rivers Wye and Severn.

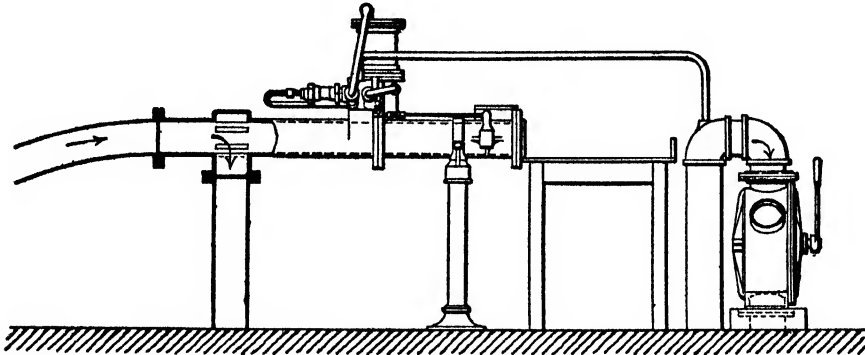
PNEUMATIC (nū-măt'ik) **CAISSONS.** See FOUNDATION.

PNEUMATIC CLOCKS. See CLOCK.

PNEUMATIC DISPATCH (Lat. *pneumaticus*, from Gk. *πνευματικός*, *pneumatikos*, relating to wind or air, from *πνεῦμα*, *pneuma*, air, wind, spirit). A method of sending mail matter, telegraphic dispatches, parcels, etc., through a tube by means of air pressure. The matter to be transported is placed in a carrier so designed as to fit closely the inside of the tube while being free to move, this carrier being propelled forward by introducing air under pressure behind it or by exhausting the air in front of it. Pneumatic dispatch was discussed as early as 1687 by Denis Papin, in a paper before the Royal Society of London. A practical pneumatic dispatch system was described by Medhurst, an Englishman, in 1810. He was followed by other inventors, some of whom achieved mechanical success, but it was not until 1853-54, when a tube 220 yards long was built in London by the Electric and International Telegraph Company, to convey telegraph dispatches, that a practical working pneumatic system was put in actual operation for commercial purposes. This system was designed by Josiah L. Clark and employed a tube $1\frac{1}{2}$ inches in diameter, in which

the system has been gradually extended since. The tubes were laid in circuits, but instead of operating the circuit from a single power station each station of the circuit has a power plant, and the sections of tubes between any two stations can be operated independently of the rest of the circuit. The carriers are run in trains, each train being propelled by a piston which pushes the rear carrier of the train, and these trains are dispatched every 15 minutes. Every train stops at all stations, where the carriers for that station are taken out and others for succeeding stations are inserted.

The London system of pneumatic dispatch differs from those of continental cities just mentioned chiefly in being a radial system instead of a circuit system. The tubes of this vast system radiate from a central power station to substations located at various points. The first London tube was installed by Siemens Brothers in 1870, but the present lines have been greatly improved over the original construction and systems of pneumatic dispatch are naturally common to other British cities. Mention should be made of the small tunnels and



SENDING AND RECEIVING APPARATUS.

the carriers were dispatched in one direction only. This system was improved by C. F. Varley, who succeeded Mr. Clark as the engineer of the company named and who increased the diameter of the tubes to $2\frac{3}{4}$ inches and operated the carriers in both directions, using vacuum for sending in one direction and compression for sending in the other direction. Siemens Brothers, of Berlin, Germany, later proposed a circuit system in which two tubes were used, the up tube being connected to the down tube at the distant end; the air was compressed into one end of the circuit and exhausted at the other end, and furthermore it was kept in constant circulation, so that carriers were dispatched by inserting them into the tube without stopping the air current. To stop the carriers a wire screen could be inserted across the tube which would permit the air to pass, but would stop the carrier.

The first extensive application of the Siemens system was made in Berlin, Germany, in 1865, when a circuit was built between the telegraph station and the Exchange requiring 5670 feet of $2\frac{1}{2}$ -inch wrought-iron tube. This experimental line proved so successful that the system was rapidly extended with better methods of operation until in 1897 there were 38 stations and 28 miles of tubes in use. In 1866 the first stretch of pneumatic tube was laid in Paris, and

atmospheric railway first built in London in 1863, from Euston to a station in Eversholt Street, 1800 feet, and extended in 1872 from Euston to the general post office, 14,204 feet. These were used to carry the mails for a time, but were found to be slow and expensive and were abandoned in favor of tubes.

Perhaps the first attempt at pneumatic dispatch in America was made by A. E. Beach, who invented and exhibited a full-size working model of an atmospheric railway in 1867. Some years later Mr. Beach began the construction of an atmospheric railway tunnel under Broadway, New York City, and had completed a short distance of tunnel when the work was abandoned.

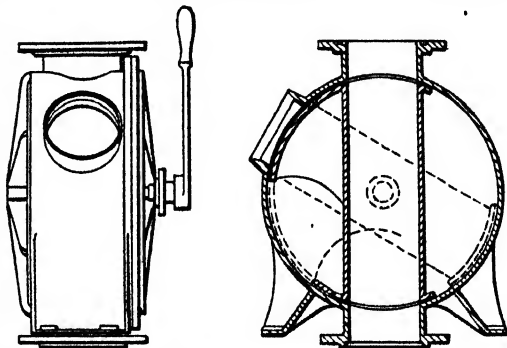
The use of pneumatic dispatch in America has become quite extended and perhaps the most extensive application is of small pneumatic tubes in stores for dispatching cash to and from a centrally located cashier's desk and for the transportation of various documents, cards, etc., in a modern large office building or hotel. There are three systems in general use, known as vacuum, pressure, and vacuum pressure, each with its advantages and disadvantages, the vacuum system being used for lighter service. The carriers are made of leather or brass with felt ends, and the whole system has to be designed most carefully for the service for which it is intended. Seamless brass tubing is gen-

rally used, which is usually $2\frac{1}{4}$, 3, or 4 inches outside diameter, with tubes of oval section 3 by 6 inches in some systems. The ends are of brass, irrespective of the material of the straight lengths, which may be iron, steel, or aluminium as well as brass. An interesting use of pneumatic dispatch is in the manufacture of photographic plates and films, where they are transferred from dark room to lark room by carriers, the power being supplied by rotary blowers. The Western Union Telegraph Company early had pneumatic dispatch systems in use in New York and Chicago, and similar private systems are in use elsewhere, including modern railway freight yards to facilitate operation.

In 1893 the United States Post Office Department installed pneumatic dispatch between its main post office and its substation at the Bourse, Philadelphia. This line was 2974 feet long, with tubes $6\frac{1}{8}$ -inch inside diameter, and the carriers traveled at a speed of about 25 miles per hour, this being an average speed for American post-office tubes, where the rate varies from 15 to 30 miles an hour. The Philadelphia system was later extended by $8\frac{1}{8}$ -inch tubes to the terminal stations of the Pennsylvania and the Philadelphia and Reading railways. In 1897-98 there were installed 683 miles of pneumatic dispatch connecting the general post office in New York City with the Brooklyn post office, the Grand Central Terminal, and intermediate substations. Congress, by an Act dated June 2, 1900, ordered a committee of experts to investigate and report upon the cost, construction, and utility of such systems for these and other large cities. This committee held investigations in 11 cities and submitted a report in 1901. By 1911 the United States Post Office Department had increased its mileage to $113\frac{1}{2}$, distributed approximately as follows: New York, $57\frac{1}{4}$; Philadelphia, 20; Boston, 14; Chicago, $18\frac{1}{4}$; St Louis, 4. As the tubes are always in pairs these figures of course represent twice the total distances between the various stations. In New York there are five main lines radiating from the central post office with 25 tube stations, 10 of which are equipped with power plants for compressing the air, while a line of 8-inch tubes is maintained between the Custom House and Appraisers Warehouse.

The Batcheller system, first installed at New York and Philadelphia in 1901, employs compressed air at a pressure of from 3 to 12 pounds, often with extra power up to 25 or 30 pounds available to remove blocks in the lines. The compressed air may be furnished by any improved type of air compressor or high-pressure blower and forces the carriage through a cast-iron pipe which is bored true and carefully jointed. The tubes, 6 and 8 inches in diameter, are laid in a double line to facilitate traffic in

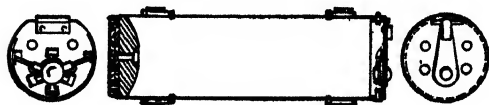
of each carrier gives access to the interior. They are from 16 to 30 inches in length, carry from 200 to 600 ordinary letters, and weigh, filled, about 30 pounds. Near each end are placed packing rings of cotton fabric secured to the main body by metal collars so as to insure a close fit in the tube. These packing rings are lubricated by vaseline, which makes easy running possible. The sending and receiving apparatus, which is located at each end and also at intermediate stations on the line, and typical forms are shown in the illustrations. In the sending apparatus two sections of the tube are supported in a swinging



SENDING APPARATUS.

frame so that either can be brought into line with the main tube, through which there is a constant current of air. After a carrier has been placed in an iron trough it passes into an open tube section and is then swung into position so that it is in line with the main tube and the carrier is swept along by the pressure. The carriers usually have a headway of from 5 to 15 seconds each and may be dispatched automatically. There are various forms of receivers, the use of which depends upon various conditions of atmospheric pressure. The action of the receiving apparatus is automatic, and as soon as a carrier arrives in the receiving chamber the latter is tilted, the carrier is discharged, and the receiving chamber returned to its normal horizontal position. Automatic apparatus is also employed at the intermediate stations, and the carriers designed for a particular station are turned aside from the main-line tube. Usually the entire system is under the direction of a competent chief at a central station who is in telephonic connection with all the various branches and supervises the distribution of carriers and other features of operation. The use of pneumatic apparatus is constantly increasing, and there are cities in the United States in which it is being installed for the transmission of small packages.

Consult: B. C. Batcheller, *The Pneumatic Dispatch Tube System* (Philadelphia, 1897); id., "Development of a System of Underground Pneumatic Tubes for the Transportation of United States Mail," in *Congress of Technology* (Boston, 1911); *Technology and Industrial Efficiency* (New York, 1911); F. B. Williams, "Pneumatic Conveyers," in *American Society of Mechanical Engineers Journal*, vol. xxxvi (ib., 1914). The results and conclusions of the committees appointed to investigate the subject of pneumatic dispatch for the United States Post Office Department have been published



SECTION OF CARRIER.

opposite directions. The carriers, over 2000 of which are used in New York City, are symmetrical in form, of the general shape shown in the illustration, and of a diameter about one inch less than that of the tube. A door in the end

from time to time by the Postmaster-General (Washington, D. C.).

PNEUMATIC GUN. A gun in which the expansive force of air under pressure is employed to discharge a thin-walled shell containing a quantity of high explosive. A pneumatic gun, the invention of Capt. E. L. Zalinski, U.S.A., was designed to discharge projectiles loaded with a high explosive, such as dynamite, the shock of the discharge being kept low by using the expansion of compressed air as the projecting force. Pneumatic guns have not proved a success. See AIR GUN.

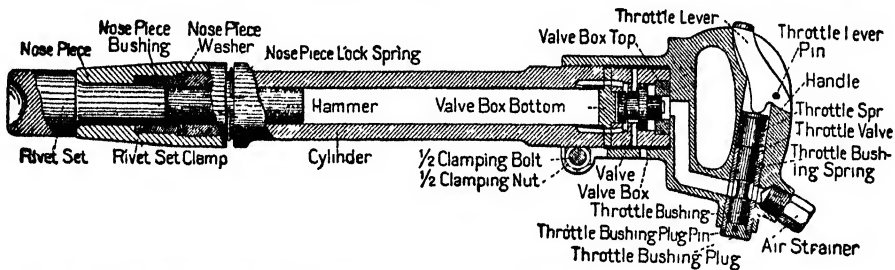
PNEUMATICS. The branch of mechanics which treats of the properties of gases, either at rest or flowing, and of solids immersed in gases. See GASES, GENERAL PROPERTIES OF.

PNEUMATIC TIRE. See BICYCLE, MOTOR VEHICLE.

PNEUMATIC TOOLS. The name given to a class of portable, self-contained motor tools (generally hand tools), for metal and wood working, operated by compressed air. Pneumatic tools are of two types, viz., percussion tools and rotary tools. The motive power used in both is air under pressure, and the motor is contained within the tool. The variety of purposes to which pneumatic tools are put is very

could be used also for riveting. This tool was the first to show a grasping handle with manually controlled throttle valve. In 1867 Deering, also an Englishman, patented a rock drill with pressure valve control and in 1897 Dr. S. W. Dennis in the United States patented a dental mallet, the first pneumatic hand tool. In 1896 came a chipping hammer by Boyer of St. Louis, and in 1899 a long-stroke pneumatic hammer where a short piston traveled a distance greater than its own length. Boyer's hammers, the first to be extensively used, were followed by those of Keller, Kimman, Richards, Meissner, and others.

The variety of constructions by which the piston stroke is actuated and controlled is large, but generally speaking all pneumatic hammers may be classed either as valveless hammers or valve hammers, one of the former class, the Keller tool, first brought out in 1899, being shown in the diagram and in various application on the accompanying plate. The Tierney hammers for riveting and chipping also found wide application. The valveless hammers have no valve beyond the striking piston, this being itself a valve to effect the proper admission of air to alternate ends of the working cylinder. In the valve hammers a reciprocating valve,



SECTION OF KELLER PNEUMATIC HAMMER ARRANGED FOR RIVETING, SHOWING OPERATING PARTS.

great, and new appliances are being constantly discovered. Some of the general mechanical operations to which such tools are applied are hammering, ramming, calking, chipping, riveting, shaving, drilling, boring, screwing, clipping, carving, and expanding tubes. These operations nearly all permit the primary mechanical actions of the tool, percussion and rotation, to be employed without modification.

Percussion Tools. The mechanism employed for utilizing compressed air to secure percussive action is similar in all percussion tools, and it will be sufficient to describe the hammer. The pneumatic hammer consists essentially of a cylinder containing a piston which, by means of suitable cylinder inlet and exhaust openings for air under pressure, is made to reciprocate back and forth in the cylinder. A tool is inserted into the front end of the cylinder loosely in such a way that the reciprocating piston or hammer strikes its near end at each forward stroke, the action being exactly analogous to that of a man driving a chisel with a hand hammer. The near end of the cylinder terminates in a handle, by which the tool is held by the operator. Compressed air is conveyed to the cylinder by means of a suitable connection or a flexible hose.

The first useful pneumatic tool was a rock drill having a hammering piston which was patented in England by George Law in 1865, and his specifications stated that this device

working either at right angles to or parallel with the striking piston, acts in combination with it to regulate the inlet and the exhaust of the compressed air.

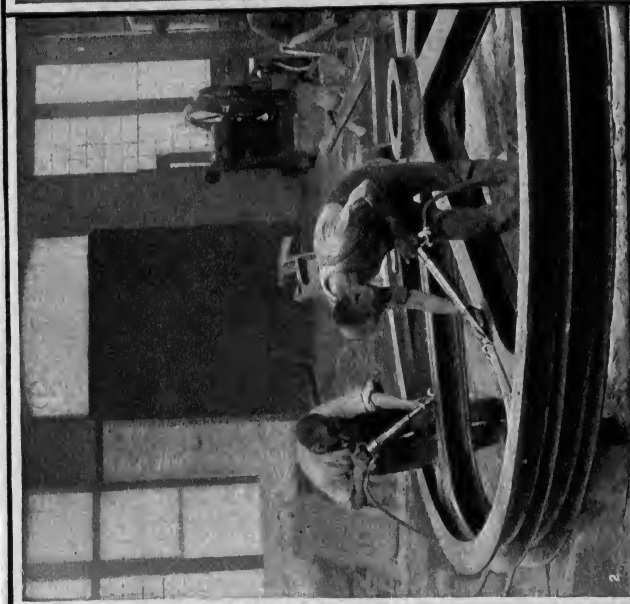
There are several constructions of both valveless and valve hammers, each of which is controlled by patents owned by the manufacturers of such tools. The general characteristics and comparative merits of the two forms of construction may be summarized as follows: valveless hammers have essentially a short stroke, and although economical in air consumption in relation to the number of blows given, they do not compare with valve hammers in giving powerful blows, which are necessary in heavy chipping and riveting. Owing, however, to their simple construction, they have probably a longer life than valve hammers, and for such purposes as beading flues, light calking and chipping, and especially carving in stone, they compare very favorably with their rivals.

The speed of the valveless hammers is very high, being from 10,000 to 20,000 strokes per minute. The speed of valve hammers for ordinary work ranges from 1500 to 2000 blows per minute, although they can be driven much faster. Their stroke is considerably longer than that of valveless hammers, and the blow struck is correspondingly more compelling. These characteristics of valve hammers make them most suitable for general and heavy clipping, calking, and riveting. This comparison is a fair sum-

PNEUMATIC TOOLS



1. EXPANDING BOILER TUBES.



2. CHIPPING CASTINGS WITH PNEUMATIC CHIPPING HAMMER.



3. WOOD-BORING.



4. PNEUMATIC RIVETING HAMMER.



5. CALKING A BOILER.

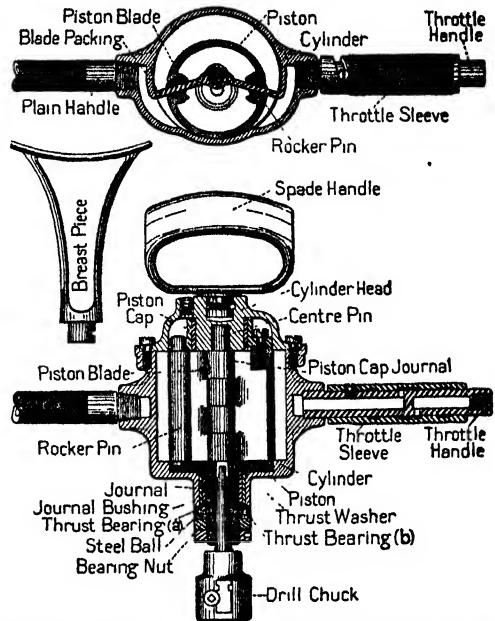
mary of recent engineering opinion on the subject, but advocates of one or the other form naturally contest the claims of their opponents.

The preceding description has referred particularly to hammers; by replacing the hammer tool struck by the piston as above described with sharpened or otherwise specially formed tools we have the hammer converted into a tool for chiseling, chipping, beading, calking, riveting, etc. In operation the apparatus is held by the handle so that the tool presses firmly against the work; air pressure is then turned on by pressing a trigger or thumb lever on the handle and the reciprocating piston begins to strike the tool, which is thus caused to cut or hammer the work in front of its nose. As previously stated, the blows are exceedingly rapid, their sound coming to the ear as a continuous buzz, and they depend for their effect upon their great frequency rather than upon their individual energy. Pneumatic percussion tools are made in a variety of sizes, but with the exception of riveters their weight and dimensions are kept small enough to permit them to be manipulated by hand. As specially designed for riveting work the percussive pneumatic tool requires brief special description. Any of the regular hammer tools may be used for riveting in connection with a holder-up for supporting the butt of the rivet, but such work is more effectively accomplished by heavier tools having a longer stroke. The yoke riveter is another common form and consists of a U-shaped yoke having at the end of one arm an inwardly projecting holder-up. The yoke riveter is made in several modifications designed for special purposes and requires generally to be handled by chain or pneumatic hoists or other power. (For illustration, see METAL-WORKING MACHINERY.) In clipping tools the stroke of the piston is reduced enormously in speed and it is provided with a piston rod which acts on a suitable hinged link construction to convert its rectilinear motion into a pincer-like movement of the clipping edges or jaws. In the forms of percussion pneumatic tools described the intensity of air pressure used is from 80 pounds to 100 pounds per square inch for all work except riveting, where it is usually increased up to 125 pounds per square inch.

Rotary Tools. Rotary pneumatic tools, commonly called portable pneumatic drills, are used for drilling and boring wood and the analogous operations of reaming, tapping, tube expanding, screwing nuts on bolts, boring cylinders and Corliss engine valve seats; also for turning crank pins, grinding steam-pipe joints, and cleaning castings. The method by which compressed air is utilized for driving the drills is generally by means of single or double acting cylinder motors, the cylinders of which are sometimes fixed and sometimes oscillating, which actuate suitable mechanism for turning the bit and are inclosed in the body of the drill. Rotary motors also are used, and an example of one of these, the Keller tool, is shown diagrammatically in the illustration and in actual use on the accompanying plate.

Pneumatic drills are made in a large number of sizes, from light drills suitable for small holes up to machines of two or three horse power. They work with from 60 pounds to 80 pounds air pressure. For performing different kinds of work, assuming the size to be ample, the only change necessary is the substitution of the

proper tool (drill, auger, saw bit, reamer, etc.) in the tool holder. A description of the motor construction of several well-known tools will give a fair idea of this mechanism. In the Little Giant drill the motor consists of four single-acting cylinders arranged in pairs and coupled



KELLER PNEUMATIC DRILL OPERATED BY ROTARY MOTOR.

to opposite ends of a crank shaft. The crank shaft carries pinions which gear with spur wheels on the tool shaft. The entire mechanism is inclosed in a shell shaped like the section of a circular cylinder. The Whitelaw drill has two double-acting oscillating cylinders geared to a crank shaft which carries a single pinion gearing with a spur wheel on the tool shaft. In the Boyer piston drill the motor is in the form of a three-cylinder single-acting oscillating engine, the cylinders being carried in a rotary frame, which, since the cylinder pistons are coupled to a fixed crank, rotates and by means of suitable gears causes the tool shaft to rotate. The motor mechanism is all inclosed in a cylindrical casing. Air is piped to these rotary tools by flexible hose exactly as in the case of percussion tools. See *DRILL, Rock Drills*, for pneumatic drills used in mining.

PNEUMATOMACHI, nū'má-tóm'a-ki. See MACEDONIANS.

PNEU'MOCOC'CUS. See Plate of DISEASE GERMS.

PNEU'MOCO'NIO'SIS (Neo-Lat., from Gk. πνεῦμα, *pneumōn*, lung + κοῖα, *koma*, dust + -ωσις, -*osis*). A pulmonary affection developing in those who habitually breathe dust-laden air. It is essentially an occupational disease. Occurring in miners it is called anthracosis and is caused by the inhalation of coal dust. Particles of iron and stone are inhaled by metal grinders and constitute the exciting factor in siderosis (grinders' rot). In those who work with stone alone the affection is known as lithosis, chalcosis, or stonecutters' phthisis. The term "kaolinosis" is applied to the affection as

seen in clay workers. The most prominent manifestation of the disease is chronic bronchitis. A catarrhal condition is established, the peribronchial lymph nodes are infiltrated, ulceration and isolated areas of pneumonia are succeeded by fibrous changes, and the lungs finally become shrunken, hard, and pigmented. The discoloration in anthracosis is black or slaty; the oxides of iron give a reddish hue to the tissues; stone and clay dust confer a yellowish tinge. The mortality among workers in dusty trades, in the absence of proper safeguards, is enormous. The treatment of fibroid phthisis, to be effective, necessitates a change of occupation. See OCCUPATIONAL DISEASES.

PNEUMOGASTRIC (nū-mō-gās'trīk) **NERVE** (from Gk. *πνεύμων*, *pneumōn*, lung + *γαστήρ*, *gastēr*, stomach), **NERVUS VAGUS**, or **PAR VAGUM**. A nerve which derives the first of its names from its supplying the lungs and stomach with nervous filaments, and the second from the wandering course it pursues. It emerges from the medulla oblongata by 8 or 10 filaments, which unite and form a flat cord that escapes from the cavity of the cranium (in association with the glossopharyngeal and spinal accessory nerves) by the jugular foramen. In this foramen it forms a well-marked ganglionic swelling, while another is observed immediately after its exit from the skull. The nerve runs straight down the neck, between and in the same sheath as the internal jugular vein and the carotid artery. Below the root of the neck its course is different on the two sides; the right nerve, running along the back of the œsophagus, is distributed to the posterior surface of the stomach, and finally merges into the solar plexus; while the left nerve runs along the front of the œsophagus to the stomach, sending branches chiefly over its anterior surface.

The pneumogastric is a mixed nerve, containing filaments both of sensation and of motion. The pulmonary branches exercise a most important influence on the respiratory acts, for when the pneumogastriacs on both sides have been divided above the giving off of the pulmonary branches, the most severe dyspnœa comes on, the number of respirations is much diminished, and breathing becomes asthmatic. The gastric branches influence the movements of the stomach, but their destruction does not materially affect the secretion of the gastric juice. Loss of voice and difficulty of breathing have been frequently traced to the pressure of an aneurism or other tumor on the recurrent or inferior laryngeal branch. The sympathy that exists between the digestive and the respiratory and circulatory organs is explained by the anatomical relations of this nerve. For example, both asthma and palpitation of the heart are often to be traced to some deranged state of digestion. Vomiting may be excited by irritation of the central or the distal extremities of the nerve. In disease of the brain the vomiting, which is often an early symptom, is caused by irritation of the central extremity; while, on the other hand, by introducing emetic substances into the stomach the vomiting is produced by the irritation of the peripheral (or distal) filaments.

PNEUMONIA, nū-mō'nī-ā (Neo-Lat., from Gk. *πνευμονία*, disease of the lungs, from *πνεύμων*, *pneumōn*, lung, from *πνέειν*, *pneîn*, to breathe). An inflammation of the substance of the lung.

There are two well-defined types, acute lobar

pneumonia and broncho-pneumonia. Under the older classification a third form is included, viz., chronic interstitial pneumonia, which will be described here. Lobar pneumonia, which is the condition usually meant when we speak of pneumonia, is an acute specific disease caused by the *Diplococcus pneumoniae* or pneumococcus of Fraenkel. It is called croupous from the fact that a fibrinous exudate is thrown into the air cells or alveoli, and lobar because an entire lobe or successive lobes of the lung are involved. The pneumococcus is an elliptical or lance-shaped organism which occurs in pairs or in short chains. It is capsulated and stains with the usual dyes; it grows readily on all culture media except potato, but flourishes best on a slightly alkaline medium. The colonies appear as small, round, white or grayish points which do not liquefy gelatin. Fraenkel, in 1884, showed the organism to have a definite and constant relation to pneumonia; but it had been thoroughly studied by other observers previous to that time, notably by Sternberg in 1880. Sternberg found the organism in his own saliva and named it after Pasteur, who also discovered it about the same time. Outside the body the pneumococcus has been found in the dust and sweepings of rooms, and is distributed by dried sputum. Wood found that in sputum kept in a moist state, and not exposed to the sunlight, the pneumococcus might survive nearly two hours; that if powdered sputum is exposed to sunlight, or even diffuse daylight, the germs die in an hour; if kept in the dark, in about four hours. Under ordinary sick-room conditions the pneumococcus becomes harmless in an hour and a half. These observations demonstrate the advantage of ample illumination and ventilation in the sick room. The pneumococcus exists in the normal secretions of the mouth and throat in from 20 to 85 per cent of healthy individuals; but these cocci are not so virulent as those found during an attack of pneumonia or during convalescence. From our knowledge of the behavior of infective germs in the human body it will be seen that any circumstance that lowers the body resistance or that produces a localized congestion, such as exposure to cold, ether anæsthesia, surgical operations, etc., may precipitate an attack of pneumonia. The disease is one of early life; it prevails especially during the winter and early spring; one attack does not confer immunity to subsequent attacks, but rather predisposes to them.

Pneumonia begins with a chill, high fever, and a severe pain in the side, attributable to the accompanying pleurisy. As the malady progresses there is a cough, with a viscid, airless, rusty sputum, later becoming yellow. Respirations are rapid and shallow, 40 or 50 to the minute; the pulse is also rapid, the cheeks are flushed, and the general prostration is extreme. There are in addition headache, sleeplessness, and sometimes delirium. These symptoms continue with more or less severity until the crisis occurs, from the fifth to the eleventh day, when the temperature falls quite suddenly, almost to normal, and rapid improvement sets in. In a few cases a crisis does not occur, but the temperature declines gradually. In fatal cases death takes place from heart failure, owing either to toxæmia or from exhaustion consequent on the effort to force the blood through the obstructed lung; or from suffocation owing to the decrease in the respiratory area. The mor-

ality from pneumonia varies from 15 to 20 per cent. Double pneumonia, in which both lungs are attacked, has a death rate of 50 per cent or more.

During the progress of an attack of pneumonia the affected portion of the lung passes through three stages, each showing characteristic signs, but merging into one another by imperceptible degrees. In the first stage, that of congestion and serous exudation, the lung is denser and darker in color than normal and on section the air cells are seen to be filled with a bloody exudation. The physical signs during this period are diminished expansion, slight dullness on percussion, and, towards the end of the first stage, broncho-vesicular breathing and moist or dry râles. This stage lasts from one to three days and is followed by that of fibrinous exudation or red hepatization. The lung is now red on section, resembling liver, sinks in water, and the air sacs are completely filled with a viscid, fibrinous fluid, mixed with blood corpuscles. Towards the end of the second stage this exudate compresses the capillaries and makes the lung tissue bloodless, so that it presents the condition known as gray hepatization, formerly distinguished as a separate stage of the disease. The physical signs during the second stage are an exaggeration of those of the first. The percussion note is absolutely flat and there are bronchial breathing and bronchophony. (See RESPIRATORY SOUNDS.) The beginning of the third stage, that of resolution, is marked by a true crisis. In a large proportion of cases the temperature drops suddenly to normal within a few hours, and is followed by free sweating and a natural sleep. The physical signs of consolidation gradually disappear, and subcrepitant râles (the so-called *râle redux*) are heard. The exudate filling the alveoli now undergoes liquefaction and is partly absorbed and partly expelled by acts of expectoration. This stage may endure from one to three weeks. Sometimes resolution is delayed, the exuded material undergoes purulent transformation, and single or multiple abscesses of the lung result.

Pneumonia is a self-limited disease, and treatment is therefore not directed towards cutting short an attack, but towards keeping up the patient's strength, supporting the heart, and reducing the temperature. It is particularly in the second stage that the patient is in danger, when the fever is at its height and the heart embarrassed. Alcohol, strychnine, and camphor are the most useful cardiac stimulants, and cold sponging and cold packs or baths the usual methods of reducing the fever. Oxygen may be inhaled when the respiration is embarrassed, but with the modern practice of supplying an abundance of fresh air this is rarely needed. The room temperature should be 65° F or lower. During the past few years excellent results have been obtained by keeping patients in tents or inclosed verandas. The cool air is a stimulant to heart and respiration, and obviates the necessity of drug giving to a great extent. During the third stage expectorants are exhibited to assist in bringing up the exudate, and during convalescence tonics are given to build up the strength and restore the wasted tissues.

Broncho-pneumonia (catarrhal or lobular pneumonia) attacks principally young children and old people by the extension downward of a bronchitis. It often occurs as a complication

of influenza, of the eruptive fevers, especially measles, and of whooping cough. The disease affects the mucous membrane lining the finer bronchial tubes (whence it has been called capillary bronchitis) and the air cells. These become blocked up by a yellowish mucoid material and larger or smaller portions of the lung are deprived of air. The symptoms of this variety of pneumonia are similar to those of the croupous form, except that the temperature rises more gradually and the rapidity of respiration is out of all proportion to the amount of tissue involved. The disease may be acute, sub-acute, or chronic in its course. The treatment is designed, as in croupous pneumonia, to keep up the strength and to assist in the expectoration of the toxic material. A steam kettle is kept going in the sick room, poultices are applied to the chest, and expectorants and a nourishing liquid diet are given throughout the attack.

Chronic interstitial pneumonia (cirrhosis of the lung) is a comparatively rare disease, found in miners, stonecutters, grinders, and others whose occupation necessitates the inhalation of irritating particles. (See PNEUMOCONIOSIS.) It sometimes follows acute pneumonia in which resolution has been delayed, and often terminates as a tuberculous process. There is an overgrowth of the fibrous framework of the lung at the expense of the respiratory elements. The organ shrinks sometimes to half its normal size, and is heavy and tough in consistence. There is always an associated chronic bronchitis, with cough and expectoration. The course of the disease is slow, extending over a period of years. The treatment consists in placing the patient under the best possible hygienic and climatic conditions—a warm climate in winter and a bracing one in summer, with the administration of tonics, such as cod-liver oil, iron, and quinine.

PNOM PENH (*Fr. pron. pnôn' pên'*). The capital of the French Protectorate of Cambodia, 130 miles northwest of Saigon, on the Mekong River (Map: French Indo-China, E 4). The most noteworthy features are the palace of the Buddhist priests, the government buildings, and the pagoda. The town has been considerably improved by the French. The shelling of cotton seeds is an important industry, and the town is also a prominent trade centre. Pop., 39,000.

PNYX, niks (*Lat., from Gk. Πνύξ*). A hill and ancient place of assembly in Athens, the exact location of which, however, is not known. It is usually placed, however, on a hill west of the Areopagus (q.v.). Consult: E. A. Gardner, *Ancient Athens* (New York, 1902); K. Baedeker, *Greece* (4th Eng. ed., Leipzig, 1909); C. H. Weller, *Athens and its Monuments* (New York, 1913).

PO (anciently *Padus* and *Eridanus*). The largest river of Italy, flowing through Piedmont and Lombardy and along the southern borders of Venetia. It rises on Monte Viso, in the Cottian Alps, and flows in a general easterly direction through the great valley between the Alps and the Apennines, emptying into the Adriatic Sea after a course of 390 miles (Map: Italy, C 2). It falls very rapidly in its extreme upper course, its ultimate sources being at a height of 6000 feet. In the lower half of its course, however, it is a comparatively sluggish stream, flowing over a raised alluvial bed so that its surface is higher than the surrounding country and its banks have to be protected by dikes

which extend continuously from Cremona to the delta. These levees, however, do not follow the smaller windings of the river, but cut across peninsulas, which, though unprotected, are cultivated, but are submerged at every considerable rise of the river. The volume of water discharged by the river is nearly equal to that of the Rhine. The greater part is received from the Alps, and nearly one-half comes from the series of large lakes on the south slope of the mountains. The principal tributaries from the left are the Dora Riparia, Dora Baltea, Sesia, the Ticino, the outlet of Lago Maggiore, the Adda from Lago di Como, the Oglio from Lago d'Iseo, and the Mincio from Lago di Garda; from the right the Po receives the Tanaro, Trebbia, Taro, and Panaro. Since the Po is fed exclusively by mountain torrents, the quantity of sediment carried by its current is enormous, the absolute quantity being one-fifth of that carried by the Mississippi or one-fourth that carried by the Ganges. As a result of this the delta of the Po grows rapidly; it advances into the Adriatic by the different distributaries at the rate of 110 to 282 feet a year, and Marinelli estimates that the annual increase is about 174 acres per year. The delta and the surrounding country consist of unhealthful marshes, and there are scarcely any towns on the lower course of the river. The chief cities on its banks are (ascending) Cremona, Piacenza, Casale Monferrato (the head of navigation, 337 miles from the mouth), and Turin. The plain of the Po is of great fertility.

POA, *pō'a*. See MEADOW GRASS.

POACHING, *pōch'ing* (OF. *pocher*, from *pocher*, pocket, probably from Ir. *poc*, Gael. *poca*, pocket, or less probably connected with OF. *pocher*, *pouchier*, to thrust, hit, and ultimately with Eng. *pochard*). In English criminal law, the act of unlawfully trespassing on another's lands for the purpose of killing or taking game, or for the purpose of catching fish. It embraces a variety of statutory offenses, with respect to game and fish, by persons having no sporting rights. These statutes are of great antiquity and were originally enacted in the interests of the landholding classes and for the protection of their hunting privileges. While the modern law still retains many traces of this influence, it is more governed by considerations of game protection in the interest of the general public. Wild animals, including fish as well as game, are not treated by English law as the subjects of larceny, and, but for special legislation, persons taking them from another's lands would be liable only to a civil action for trespass. English game and poaching statutes make such taking a crime. The existing legislation on this topic begins with the Night Poaching Act, 1828, and the Day Poaching Act of 1831. These were called forth by the rapid increase of poaching which followed the close of the Napoleonic wars. Such increase has been ascribed to the distress prevailing in agricultural districts during the third decade of the nineteenth century and to the large number of turbulent spirits thrown out of military employment and cast back into the ranks of ordinary laborers. The acts referred to above made poaching a crime instead of treating it, in its various forms, as an offense which could be condoned by a money penalty.

Poaching Game. By the Poaching Prevention Act, 1862 (25 and 26 Vict., c. 114), which

applies to the United Kingdom and which, as amended by subsequent acts of Parliament, now defines the offense and provides for its punishment, if a constable meet a suspected poacher on the highway, whom he has reason to suspect of coming from land where he has been poaching, such constable may stop and search the poacher; and if game or implements for taking game are found on him, may seize and detain them and summon him before the justices. When before the justices, if it be proved that such game was procured by poaching, or that the implements were used for that purpose, the poacher may be fined in a penalty of £5, besides forfeiture of the game and of guns, nets, and other implements which he may have so used. The person convicted may appeal if he chooses to the next Quarter Sessions, or in certain cases to the Court of King's Bench. Except as provided otherwise, the rule applies that whoever first catches (whether legally or illegally) a wild animal is entitled to the property in it; and as game is in the category of wild animals, the poacher is entitled to keep the game, except where it was caught on private land without permission of the owner or possessor. The game laws have often been described as too severe against poachers, as most of the penalties are cumulative, and the magistrates are usually, as game preservers, inclined to convict.

Poaching Fish. The law of fisheries is not uniform in the United Kingdom. In England and Ireland the general rule is that any one may fish freely in the sea and in all other navigable waters. But there is an exception to this general rule, which consists in this, that as the crown could before Magna Charta (which took away such right) legally grant a several or exclusive fishery in the sea or navigable river to an individual, and as this was, in point of fact, often done, it follows that it is not uncommon to find, even at the present day, an individual, generally the lord of an adjacent manor, claiming a several fishery in public waters. If he can prove that he has exercised this exclusive privilege from beyond the period of legal memory, it will be presumed that it dates from before Magna Charta, and therefore will be legal. When such is the case the public have no right to fish even in a navigable river or the sea at the specified places, the sole fishery being vested in this individual owner. In streams not navigable the rule is that each riparian owner, i.e., the owner of the lands on the bank of the stream, has a right to a several or exclusive fishery up to the middle line of the stream. If he is owner on both sides of the stream, then he has the exclusive fishery in the whole of the stream, so far as his lands extend. As to ponds, whoever is owner of the soil is the owner of a several fishery there, unless he has let it to another. As a general rule there is no such thing as a right in the public to fish anywhere except in a tidal river or the sea, and that is subject to the exception of an individual claiming a several fishery, as before mentioned. It is often supposed that, at all events, if a highway adjoins a private stream, any one passing along the highway may fish in the stream. But this is a mistake. Even where a private stream is subject to navigation by the public, the right to fish in its waters is strictly preserved to the owner.

The general rule as to all several, i.e., exclusive, fisheries is that whoever poaches fish

commits an offense, for which he may be summoned before justices and fined £5 over and above the value of the fish taken; and if the fishery where he poaches adjoins the dwelling house of the owner of the fishery it is a still higher offense, for it is then an indictable misdemeanor. By statute also the fish poacher loses the nets, lines, or other implements employed by him.

The laws of Scotland as to poachers of fish differ in some respects from those of England. In Scotland salmon belongs *prima facie* to the crown, not merely in rivers, but on the sea-coast. Hence the public have no right to fish with nets even in the sea, except by leave of the crown or of the grantee of the crown at the spot in question. Whoever poaches salmon in a river, lake, or within a mile of the seashore incurs a penalty of £5, besides forfeiting the boat, net, or other engine used to catch the fish. While the law is as above stated with respect to fishing salmon with nets, a crown grant is required to enable even a riparian owner to angle for salmon. As regards fish other than salmon the general rule is that the riparian owner may catch all the fish he can, provided he do not interfere with the superior right of some crown grantee of the salmon fishery. A person who poaches trout or other fresh-water fish with a net, or by double rod fishing, or cross-line fishing, or set lines, etc., incurs a penalty of £5, besides forfeiture of the fish caught. And he may be arrested if he is net fishing, but not if he is fishing in another way. In the case of all poachers of trout (except angling poachers, who can neither be arrested nor yet have their fish or fishing rod taken from them by force) the owner of the fishery, or any person authorized by him, may seize the nets, boats, and fishing implements if the poachers are found on the spot.

Poaching is not known as a crime in the United States. The person who without authority kills and carries away game or fish from the land of another is liable to a civil action of trespass on the land, as also for the value of the fish or game so taken, which, by the killing, became the property of the owner of the land. The game laws which have been generally enacted in the interests of the public apply to the taking or killing of game or fish whether on public or on private lands.

Consult Paterson, *Treatise on the Fishing Laws of the United Kingdom* (London, 1873); Sir J. F. Stephen, *History of the Criminal Law of England* (3 vols., 1b., 1883); Woody, *Game Laws of England* (1b., 1896); G. C. Oke, *Game Laws* (4th ed., 1b., 1897). See FISHING, GAME LAWS.

POBEDONOSTSEV, p6-by6'd6-n6s'ts6f, KONSTANTIN PETROVITCH (1827-1907) A Russian statesman, procurator of the Holy Synod. He was born at Moscow, and after distinguishing himself in legal studies at St Petersburg became professor of civil law in the University of Moscow and secretary of the Senate in that city. In 1860 he became tutor of the Imperial princes. In 1872, after holding various important positions, he was named member of the Council of State, and in 1880 procurator of the Holy Synod. Thereafter he virtually directed the ecclesiastical policy of Russia and greatly influenced national politics. As an uncompromising advocate of autocracy and of the Orthodox faith, he was largely responsible for oppressive

legislation. The system of parochial schools which he originated was designed primarily to promote this object. He was one of the most notable authorities on Russian civil law. Besides his important three-volume treatise on this subject, his writings include historical, literary, and biographical studies, besides translations and compilations. The revolutionary movement of 1905 made his position untenable, and he resigned in that year.

PO'CAHONTAS (c.1595-1617). A celebrated Indian princess, daughter of Powhatan (q.v.). She is first mentioned in the *True Relation* (1608) by Capt John Smith (q.v.) as "a child of tenne yeares old, which not only for feature, countenance, and proportion much exceedeth any of the rest of his [Powhatan's] people, but for wit and spirits the non-pareil of his country." She seems to have formed an attachment for the whites, especially for Smith, and to have been a frequent visitor at Jamestown until Smith left in October, 1609, when her visits ceased. In April, 1612, while at the village of her uncle, the King of Potowomek, she was lured aboard an English vessel by Captain Argall and was taken to Jamestown as a hostage for the return of several white prisoners and some stolen property. Here she was converted to Christianity and in April, 1613, was baptized and christened Rebecca. In April, 1614, she was married to John Rolfe (q.v.), with whom, two years later, she went to England, there she was received with great enthusiasm, as the daughter of an American king. Then it was that the celebrated story about her rescue of Captain Smith first appeared. In a letter to the Queen (1616) Smith asserted that in 1607, when he, a captive among the Indians, was about to have his brains knocked out against a large stone, Pocahontas had "hazarded the beating out of her owne braines" to save his, and had on another occasion warned the English of a threatened Indian attack, besides furnishing food to the famishing colonists. It is for this rescue story, much elaborated and embellished by Smith in his *Generall Historie* (1624), which was printed 16 years after the events described therein, that Pocahontas is chiefly remembered. Until Charles Deane attacked it in 1859 it was seldom questioned, but, owing largely to his criticisms, it soon became somewhat discredited. John Fiske, however, in his *Old Virginia and Her Neighbors*, valiantly defends its authenticity. Pocahontas died March 29, 1617, at Gravesend, and was there buried, the following curious entry being made in the parish records "1616 (1617), May 2 j, Rebecca Wrothe wyff of Thomas Wrothe, gent a Virginia lady borne, here was buried in ye chauncell." Pocahontas and Rolfe had one son, Thomas, who, after living for many years in England, migrated to Virginia. From him many prominent Virginia families, including the Bollings (Mrs. Edith Bolling Galt was married to President Woodrow Wilson in 1915), the Murrays, the Guys, the Whittles, the Robertsons, the Elbridges, and that branch of the Randolphs from which sprang John Randolph of Roanoke (q.v.), trace their descent.

Bibliography. For arguments opposing the rescue story, consult Deane's edition of Smith's *True Relation* (1866); E. D. Neill, *Pocahontas and her Companions: A Chapter from the History of the Virginia Company of London* (Albany, 1869); Henry Adams, *Chapters of Erie*

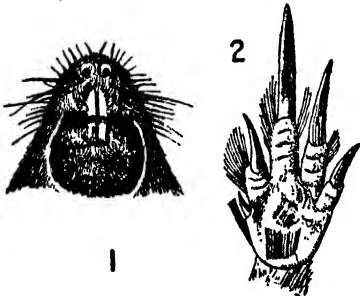
and Other Essays (New York, 1871). For arguments in its favor: Arber, *Smith's Works* (1884); Charles Poindexter, *Capt. John Smith and his Critics* (Richmond, Va., 1893); W. W. Henry, in *Proceedings of the Virginia Historical Society* (ib., 1882); L. G. Tyler, *England in America* (New York, 1904); John Fiske, *Old Virginia and her Neighbours* (2 vols., Boston, 1897; new ed., ib., 1900). Consult also: Eggleston and Seelye, *Pocahontas, Including an Account of the Early Settlement of Virginia* (New York, 1879); Robertson and Brock, *Pocahontas and her Descendants* (Richmond, Va., 1887); E. B. Smith, *Pocahontas and Captain John Smith* (Boston, 1914).

PO'CATELLO. A city and the county seat of Bannock Co., Idaho, 134 miles north by west of Ogden, Utah, on the Port Neuf River and on the Oregon Short Line (Map: Idaho, F 7). It is a division headquarters of this railroad and has yards and machine shops. Mining, stock raising, and agriculture constitute the leading industries. The city is the seat of the Idaho Technical Institute and contains the Holy Cross School, a Carnegie library, a large Y. M. C. A. building and a splendid high school. Pop., 1900, 4046; 1910, 9110; 1914 (U. S. est.), 11,267.

POCETTI, pò-chèt'tè, BERNARDINO BARBATELLI (1542 or 1549-1612). An Italian painter, born at Florence, where he was a pupil of Ridolfo Ghirlandaio. He enjoyed great reputation as a painter of grotesques, and after his return from Rome, where he had studied the works of Raphael and other masters, executed many mural paintings in Florence (where some are still to be found) and throughout Tuscany. These are notable for landscapes and graceful figures.

PO'CHARD. An Old World sea duck (*Aythya farina*), with a long, broad, and very flat bill, the wings short, and the tail short and rounded. It is smaller than the mallard, but rather larger than the widgeon. The head and neck are bright chestnut, the eyes red. The windpipe of the male, in all the pochards, terminates in a labyrinth composed partly of bone and partly of membrane. It breeds in far northern regions, and in winter migrates southward, even as far as Bengal. It is highly esteemed for the table. The canvasback and the redhead (qq.v.) of the United States are closely allied species. The pochard is also known as dunbird and poker. See DUCK.

POCKET BOROUGH. See BOROUGH.

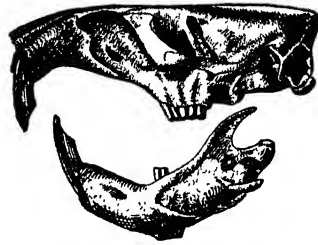


POCKET GOPHER.

1, the face, showing openings on each side of the cheek pouches; 2, left fore foot, showing great digging claws.

POCKET GOPHER, or **POUCHED GOPHER.** Any gopher (q.v.) of the family Geomyidae,

characterized by their large cheek pouches, which are furry inside and open outside of the mouth. The salamander of the Southern States



SKULL OF POCKET GOPHER.

and the common gopher of the Western prairies are examples. Consult C. H. Merriam, "Monographic Revision of Pocket Gophers," in *North American Fauna*, No. 8 (Washington, 1909).

POCKETKNIVES. See CUTLERY.

POCKET MOUSE. A mouse of the American family Heteromyidae. It has external cheek pouches, lined with fur and opening at the angles of the lips. Several forms live on the arid plains of the western United States and Mexico. The true pocket mice are small, grayish, nocturnal animals, that come out of their burrows only at night to gather seeds and similar provender, which they carry in their cheek pouches into their holes and store there for winter use. Another genus includes the kangaroo rat (q.v.).

POCO, pò'kò (It., little). A term much used in music, as *poco animato*, rather animated; *poco forte*, rather loud; *poco a poco*, by degrees, little by little.

PO'COCKE, EDWARD (1604-91). An English Oriental scholar. His father spelled the name Pocock. He was born at Oxford, where he graduated B.A. from Corpus Christi College in 1622, and in 1629 he took orders. He early turned his attention to Oriental studies and had the best teachers that England could supply. In the Bodleian Library he discovered a manuscript of the Syriac version of the New Testament, containing four epistles (2 Peter, 2 and 3 John, and Jude), which had been missing in the earlier editions, and published them under the title *Versio et Notæ ad Quatuor Epistolas Syriacæ* (Leyden, 1630). While chaplain to the English Turkey merchants at Aleppo (1630-35) he mastered the Arabic language, continued the study of Hebrew, Syriac, Samaritan, and Ethiopic, and collected valuable manuscripts. In 1634, when the plague raged in Aleppo, he remained in the town when others fled to the mountains. In 1636 Pococke was appointed the first professor of a new Arabic lectureship at Oxford; in 1637-41 he was again in the East, especially at Constantinople. During the Civil War and the Commonwealth his connection with Laud and his Royalist sympathies exposed him to much annoyance. His college presented him to the living at Childrey, Berkshire (1642), where his parishioners cheated him and quartered soldiers at the rectory. The revenues of the Arabic lectureship were illegally seized, but by the exertion of John Selden and other friends Pococke was reinstated. He was made professor of Hebrew (1647), with a canonry, of which he was deprived in 1650, while allowed to retain his professorships through the unanimous interposition of all the heads of houses, masters, and

scholars at Oxford. In 1655 a plan to deprive him of his living was defeated through the influence of John Owen and other enlightened men. He published his great work, the *Specimen Historiæ Arabum*, at Oxford in 1649 (2d ed., by Joseph White, 1806). Other works of the same period are the *Porta Mosæ*, an edition of the six prefatory discourses of Maimonides on the Mishna, with Latin translations and notes (1655); the *Contestatio Gemmarum*, a Latin translation of the *Annals* of Eutychius (1658); and a treatise on *The Nature of the Drink Kauhî or Coffee, Described by an Arabian Physician* (1659). He gave much assistance in the preparation of Walton's Polyglot (1657). At the Restoration he was reinstated in his canonry of Christ Church, and thenceforth lived in quiet and ease at Oxford, but busied himself in preparing several works, the most important of which were commentaries on the Minor Prophets. He died Sept. 10, 1691. Pococke's life was written by the Rev. Leonard Twells and prefixed to his edition of *The Theological Works of the Learned Dr. Pococke* (2 vols., London, 1740).

POCOCKE, RICHARD (1704-65). An English clergyman and traveler. He was born at Southampton and graduated at Corpus Christi College, Oxford. In 1725 he became precentor of Lismore and in 1734 vicar-general of the diocese of Waterford and Lismore. The latter appointment was made during his absence, for from 1733 to 1736 he traveled through Europe to Greece. During 1737-42 he journeyed in Egypt and the East, afterward publishing in folio *A Description of the East and of Some Other Countries* (2 vols., 1743-45). This work, dedicated to the Earl of Chesterfield, earned for the author the archdeaconry of Dublin (1755). In 1756 he became Bishop of Ossory. His *Account of Some Antiquities Found in Ireland* was published in the second volume of the *Archæologia* (1773). In 1760 Pococke went as far north as the Orkneys, between April and October traveling 3391 miles on horseback. His *Tours in Scotland, 1747, 1750, 1760*, were edited, with a biographical sketch, by Kemp (1887). Pococke established the Lintown factory in 1763 to further the Irish linen trade, and left a bequest for its maintenance. As Pococke College it is still perpetuated under the Incorporated Society for Promoting English Protestant Schools in Ireland. In 1765 he was transferred to the bishopric of Meath. Accounts of his travels in England, Scotland, and Ireland were republished between 1888 and 1891.

POCO'SIN (a word of Indian origin, also spelled *percoarson*, *percocsin*, *pocoson*, and *poquoson*). A type of vegetation characteristic of eastern North Carolina and almost restricted to that State. (The word is occasionally met in other southeastern States, with slightly different meaning.) A typical North Carolina pocosin is located on level uplands, between streams, and has a permanently saturated, peaty soil overlying sand or sandy loam. There is a rather sparse growth of trees, mostly black pine (*Pinus serotina*), and a dense undergrowth of evergreen shrubs and vines, averaging a few feet in height. Some of the pocosins cover several square miles and have coffee-colored streams running out of them in various directions. They are of little economic value at present, but the peat in them may be utilized at some future time. Descriptions of pocosins can be found in several publications of the

North Carolina Geological Survey, in the report on the agricultural features of North Carolina in volume vi of the Tenth Census, and in some of the government soil surveys of eastern North Carolina counties.

PODAGRA, pò-dàgrà or pòd-à'grà. See GOUT.

PODARGE, pò-dàr'jè (Lat., from Gk. ποδάργη, swift-footed). One of the Harpies (q.v.).

PODBIELSKI, pòd'bè-él'ské, THEOPHIL VON (1814-79). A Prussian general. He was born at Köpenick and entered the army in 1831. Afterward he studied in the Kriegsakademie from 1836 to 1839. He became quartermaster-general of the army in Schleswig and Holstein (1863), held the same post in the war with Austria, after serving as director of the General Department of War (1866), and is best known for his dispatches from the field in the Franco-Prussian War (1870-71), when he was again quartermaster-general. One of his terse messages was "Nichts neues vor Paris." Podbielski was appointed inspector general of artillery after the close of the French campaign. He was the father of Viktor Podbielski.

PODBIELSKI, VIKTOR VON (1844-1916). A German officer and statesman, born at Frankfurt-on-the-Oder, a son of Theophil von Podbielski. In 1862 he joined the Eleventh Lancers. During the Austro-Prussian War of 1866 he served as adjutant of the Sixth Infantry Division and during the Franco-German War on the general staff of the Tenth Army Corps and as major general of the Thirty-fourth Cavalry Brigade. He entered the Reichstag in 1893, and in 1897 succeeded Von Stephan as head of the Imperial postal service. In 1901 he became Prussian Minister of Agriculture. He resigned in 1906 because of revelations concerning his connection with a notorious firm of government contractors.

POD CORN. See MAIZE.

PODEBRAD, pò'dyà-brát, GEORGE (1420-71) King of Bohemia from 1458 to 1471. He was born at Poděbrad in 1420, the son of a Bohemian noble. He adhered to the Moderate party of the Hussites during the reign of Sigismund, but when, on the death of that monarch, the Catholic barons (1438) carried the election of Albert V of Austria (II of Germany), Podebrad allied himself with the Utraquists, who offered the sovereignty of Bohemia to Casimir, brother of Ladislas III, King of Poland. From this time Podebrad's influence gradually increased, and in 1444 he became the leader of the party of Utraquists and later was made administrator of the realm during the minority of the child King, Ladislas Posthumus, the son of Albert. In 1448 he had obtained possession of Prague, and in 1452 was acknowledged Regent by the whole of Bohemia. Ladislas Posthumus died in 1457, and in 1458 Podebrad was chosen his successor. He strove to bring about a peaceful settlement of the religious discussions that had desolated the land, and agreed secretly to lead the country back to the Roman Catholic church. He failed to fulfill this promise, upholding the Utraquists, and was excommunicated by Pope Paul II in 1465. The Catholics of Bohemia were incited to insurrection, and Matthias Corvinus (q.v.), King of Hungary, the son-in-law of Podebrad, was induced to invade Bohemia. The Hungarians were surrounded at Wilimow and forced to cease from hostilities. In spite of the magnanimity shown by Podebrad

on this occasion, Matthias acted falsely towards him, and in 1469 had himself crowned King of Bohemia and Margrave of Moravia. Pödebrad instantly summoned the Bohemian diet, and proposed to the assembled orders that they should take Ladislas, son of Casimir IV, King of Poland, as his successor, while his own sons should merely retain the family possessions. By this means he obtained the Poles for allies; the Emperor Frederick III also declared in his favor, while many of his Catholic subjects were reconciled to him, so that the Hungarians found it advisable to conclude a peace. Pödebrad died March 22, 1471. Consult: Franz Palacky, *Geschichte von Böhmen*, vol. iv (Prague, 1857-60); Max Jordan, *Das Königtum Georgs von Podiebrad* (Leipzig, 1861); Adolph Bachmann, *Böhmen und seine Nachbarländer unter Georg von Podiebrad* (Prague, 1878); C. E. Maurice, *Story of Bohemia* (New York, 1896).

PODESTÀ, pò-dës-tà' (It., power). A term applied to the chief magistrate in the mediæval cities or states of Italy. The office of podestà appears to have been first instituted in the twelfth century, when the Emperor Frederick Barbarossa, having for a brief term reestablished the Imperial authority in Lombardy, placed officers with almost supreme power over the various towns. When the Lombards afterward rose in rebellion against Frederick, the office was abrogated, but it was soon revived by themselves. As the chief cause of the appointment of the podestà was the jealousy that existed between the richer citizens and the nobles, he was usually a citizen of some neighboring state who had formed no entangling alliances. During his term of office he was prohibited from cultivating any intimate connections in the city which he governed. His functions were at first largely judicial. The podestà usually held office for a year only, but occasionally his power became so great that he secured reelection during a succession of years and was the despotic ruler of the city.

PODGORITSA, pód'gó-ré-tsá. A town in Montenegro. See MONTENEGRO.

PODGORZE, pód-gór'zhe. A town in the Crownland of Galicia, Austria, on the right bank of the Vistula, opposite Cracow, with which it is connected by the Franz-Joseph's Bridge. It has brickyards, cement and leather factories, salt works, and a good trade in trimmed lumber and eggs. Pop., 1900, 18,100, mostly Poles, and more than one-third Jews.

PODÍUM (Lat., from Gk. πώδιον, *podion*, little foot, dim. of πούς, *pous*, foot). In classic architecture, (a) an unbroken pedestal course supporting a wall or colonnade, as distinguished from the stepped stylobate of Greek temples; (b) the solid basement or substruction upon which Roman and Pompeian temples were erected, approached by a flight of steps at one end. Hence, in modern usage, any part of a building resembling (a) or (b) in form and serving as a pedestal for an important feature, e.g., the square high base upon which stands the drum of a dome. Like a pedestal, a podium has a base course, die, and cap.

PODMORE, FRANK (1855-1910). An English writer on psychical research, born at Elstree, Hertfordshire. He was educated at Pembroke College, Oxford. From 1879 to 1907 he held a higher division clerkship in the secretary's department of the post office, and from 1882 to 1909 was a member of the council of

the Society for Psychical Research. He was one of the founders and a member of the first executive committee of the Fabian Society, the name of which he probably originated. Podmore adopted a psychological explanation of psychic phenomena. His writings include: *Phantasms of the Living* (2 vols., 1886), with Edmund Gurney and F. W. H. Myers; *Apparitions and Thought Transference* (1894); *Studies in Psychical Research* (1897); *Modern Spiritualism* (1902); *Spiritualism* (1903), with E. W. Cook; *The Naturalization of the Supernatural* (1908); *Mesmerism and Christian Science* (1909); *Telepathic Hallucinations: The New View of Ghosts* (1910); *The Newer Spiritualism* (1910). Consult Henry Holt, *On the Cosmic Relations* (2 vols., New York, 1914).

POD'OCAR'PUS (Neo-Lat., from Gk. πούς, *pous*, foot + καρπός, *karpós*, fruit; so called from the thick stalk which, unlike the case of other conifers, supports the fruit). A genus of trees belonging to the Coniferales and giving name to the family Podocarpaceæ. It includes about 60 species, well distributed throughout the Southern Hemisphere and holding the same geographical and economic position that the pine family (Abietaceæ) holds in the Northern Hemisphere. They are distinguished from members of the pine family in bearing no cones, the solitary ovule (which becomes the seed) being usually conspicuously stalked above the surrounding bracts. The podocarps resemble the pine family in having winged pollen grains, a feature in which these two families differ from the other families of Coniferales. The leaves of *Podocarpus* are often broad, in marked contrast with the needle leaves of pines. Some of the species are valuable timber trees, e.g., *P. cupressina*, of Java and the neighboring islands and the South Sea Islands, a beautiful species 50 to 80 feet tall, with spreading pendulous branches and yellow wood that takes a fine polish. *P. totara*, the totara or totara pine, is the most valuable timber tree of New Zealand, in the southern parts of which country its trunk has been known to attain a diameter of 12 feet. Its wood is superior to Baltic pine in durability and for shipbuilding. The wood of *P. elata*, the gagali of the Fijians, is peculiarly elastic. It abounds in Queensland and New South Wales, where it attains a height of 100 feet and a diameter of from 2 to 3 feet. The timber is free from knots, soft, close-grained, and easily worked, and is much used for cabinet and joiners' work. See DACEYDIUM.

PODOLIA, pò-dó'lyá. A government of southwest Russia, bounded by the Government of Volhynia on the north, Kiev on the east, Kherson and Bessarabia on the south, and the Austrian Crownland of Galicia on the west (Map: Russia, C 5). Area, 16,224 square miles. The region is traversed from northwest to southeast by two ranges of hills separated from each other by the valley of the Bug. The Dnieper flows along the southwestern boundary. The climate is moderate, the annual temperature at Kamen etz-Podolsk, the capital, averaging 48.4°. Podolia has a rich, black soil which yields considerable quantities of grain for export. Besides cereals, tobacco and large quantities of sugar beets for the local sugar mills are raised. The chief products of the house industry are textiles. In 1910 there were in Podolia more than 5000 manufacturing establishments, with about 40,000 employees and an output valued at more

than \$48,000,000. The principal manufactured products are sugar (in the production of which Podolia is exceeded only by the Government of Kiev), spirits, flour, and tobacco. Pop., 1914, 3,955,300, including more than 240,000 Roman Catholics and nearly 400,000 Jews.

POD'OPHYLLIN (from Neo-Lat. *Podophyllum*, from Gk. *πούς*, *pous*, foot + *φύλλον*, *phylon*, leaf; so called because the five or seven divisions of the leaf bore a fancied resemblance to the foot of some animal). The name commonly given to the resin obtained by means of rectified spirit from the root of *Podophyllum peltatum*, or May apple, a plant common throughout the United States. This resin, which occurs as a pale-greenish amorphous powder, has (as well as the root from which it is derived) been introduced into the United States pharmacopœia. It is an active purgative and seems to have the power of relieving the liver by exciting copious bilious discharges. Podophyllin is very soluble in alcohol and moderately so in ether.

POD'OPHYLLUM (Neo-Lat., from Gk. *πούς*, *pous*, foot + *φύλλον*, *phylon*, leaf). A genus of plants of the family Berberidaceæ. *Podophyllum peltatum*, called May apple, mandrake (q.v.), hog apple, and wild lemon, is a common perennial plant in moist woods of North America. Its solitary white flower in the axil of the two leaves is followed by an oval, smooth, yellowish, succulent, mawkishly sweet, subacid fruit, which is not generally considered agreeable. The rootstock has alterative, emetic, and cathartic properties and is of common use in medicine.

POE, EDGAR ALLAN (1809-49). An American poet and prose writer, born in Boston, Jan. 19, 1809. The grandson of a prominent patriot during the War of the Revolution, the son of an actor, David Poe, whose wife (*née* Elizabeth Arnold) was his superior in charm if not in power on the stage, E. A. Poe shared for several years the wandering life and vicissitudes of his parents, but after his mother's early death he was adopted by Mrs. John Allan, the wife of a business man of Richmond, Va. The boy's personality gave promise of fascinating qualities, and he received the best educational opportunities within the reach of his adoptive parents. He was sent to a good school in Richmond; was taken to England in 1815 and placed in the Manor House School in the neighborhood of London, amid surroundings that made a deep impression on his sensitive imagination. In one of his most striking sketches, "William Wilson," he recalled in vivid description the school, the village, and the old church to which the boys were paraded twice on Sunday. In 1820 the Allans returned to Richmond, and Edgar read the classics and studied French under a pedantic Irish teacher, learning with great quickness; he was versatile, fond of reading, somewhat given to satirical comment on his fellows, agile and vigorous in movement and courteous in manner. In 1826 Poe entered the University of Virginia, which had just been established by Thomas Jefferson at Charlottesville on new and promising lines of organization and methods of work. During his course there Poe gave his attention chiefly to Latin, Greek, Spanish, French, and Italian. Heavy drinking and card playing for money were popular forms of dissipation among students, and Poe's life was not wholly free from them. There is, however, no foundation for the reports of excessive indul-

gence on his part; he seems to have been neither better nor worse than many of his contemporaries. At the end of the first session he won honors in Latin and French, but his irregularities offended Mr. Allan, who refused to pay his gambling debts to the sum of \$2500, and Poe was placed in his adoptive father's counting room. The work was very distasteful to him, and he soon made his escape from its drudgery to return to Boston, where his earliest volume, *Tamerlane, and Other Poems*, was brought out by a printer in 1827. The influence of Byron was then at its height, and Poe's work showed how sympathetically he had studied the English poet, whose mastery of the lyric form has given him a foremost place among the singing poets. The verse in the little volume was notable neither for power nor promise of original thought, but it was full of poetic feeling, of sensitiveness to the melody of words, and of rich imagery. In May, 1827, Poe enlisted in the United States army as a private soldier, served two years with fidelity, was honorably discharged, secured a reconciliation with Mr. Allan, and furnished more substantial evidence of his possession of original power by the publication of "Al Aaraaf" and other minor poems in Baltimore in 1829. Mr. Allan married a second time in October, 1830, having previously, by way of settling his wayward ward in life, secured for him an appointment to the Military Academy at West Point. Poe was then 21 years of age, a ready French scholar, had read widely if not wisely, and was a good mathematician. He was, however, neglectful of his military duties, was often under arrest, and at the end of six months was dismissed from the academy by court-martial. He was penniless and could no longer look to Mr. Allan for aid. In March, 1831, another volume from his hand appeared, this time in New York, under the title *Poems*. All the poems save six which had appeared in the previous volume were reprinted, with important changes in several instances, and six additional pieces were given to the public. Among the latter were "The Valley of Unrest," "The City in the Sea," "Lenore," "To Helen," and "Israfel." No poetry of kindred beauty had appeared in America, and in certain respects those remarkable poems have not been surpassed. They showed a wonderfully sensitive ear for verbal notation, a touch so delicate and sure that it may be described as magical, and an imagination at once sombre and beautiful. An artist by temperament and by imitation, Poe had no lessons to teach, no truths to enforce. He cared supremely for beauty for its own sake; and so completely did he master the resources of verse that he was able, by mere collocation of sound, to produce an almost hypnotic effect, to throw a spell over his readers the secret of which resides in the beguiling of the ear quite as much as in the awakening of the imagination.

The poet's activities were thenceforth concentrated on the task of supporting himself with his pen—a task which was rendered exceedingly difficult, not by lack of opportunities or of friends, but by irregularities of life and a restive, sensitive, and capricious temperament. In Baltimore, where he next endeavored to secure a foothold, he found friends and made his first popular success by winning (1833) a prize of \$100 offered for the best prose story by the *Saturday Visitor*, a monthly literary journal.

The story selected by the judges was "A Manuscript Found in a Bottle." Poe was then living with his father's widowed sister, Mrs. Clemm, whose daughter Virginia, then 11 years old, he married two years later. In the meantime Mr. Allan had died without any recognition of his adopted son in his will, and the poet was at last compelled to face life with such resources as nature had given him. These were ample had they been wisely directed and husbanded. He had proved himself a master of lyrical poetry and of the short story, and he was beginning to write criticism of an order new in the United States. He was also drinking too freely on occasion, though how frequently or heavily cannot now be known. In the course of his life, however, it is certain that his abnormally sensitive nervous organization was seriously affected by an indulgence which to men of more vigorous physique would have been of slight importance. The uncertainty of his life, the pronounced strain of melancholy in his temperament, the brooding intensity of his imagination, the weakness of his will, and the terrible strain of his wife's long illness contributed to make him the victim of a habit against which he fought at times with desperate courage and for long periods with success. He was never, except for short periods, what is known as a dissipated man, but strong drink of any kind was a poison to him and the least indulgence prostrated him.

From Baltimore Poe removed to Richmond, which he always regarded as his home and where he found congenial and helpful friends. As editor of the *Southern Literary Messenger* he secured the happiest conditions which he was to know. He was an indefatigable worker, producing stories, poems, and critiques with ease, and at this time with evident pleasure. To this period belong a number of his most characteristic tales of fantasy: "Berenice," "The Fall of the House of Usher," "Ligeia," "Eleonora," "The Masque of the Red Death." These tales were not without forerunners in other literatures, but they combined a quality of imagination, a skill in taking possession of the imagination of the reader, and a perfection of form which have given them a place by themselves in the literature of the world. They close in upon the mind, by a subtle use of suggestion and repetition, until a purely phantasmal world becomes real and abnormal figures take on the semblance of life. The skill with which the transition from the actual to the phantasmal is effected is the supreme triumph of Poe's art in fiction. The men and women who appear in these tales are all phantoms, without warmth, passion, character; they and the realm in which they move are stamped with unreality. Poe's great limitation lies in the narrowness of his range and the lack of deep-rooted vitality in the creatures of his imagination. He deals habitually with abnormal aspects of life and phases of experience. His landscapes, characters, incidents are all in the realm of fantasy. These characteristics relate him to the modern Decadents, whom he has deeply influenced; but he differs widely from the men who have followed his lead in the absolute purity of his thought and imagination.

In 1835 literature of high quality was being produced in the United States, but public taste was uneducated, and crude, sentimental, and cheap fiction was widely read. In the columns of the *Southern Literary Messenger* Poe began

to print criticism of a kind and quality that were new to most American readers. He broke away entirely from the trammels of provincialism in taste and judgment, and applied to current writing the standards of the literature of the world. His handling of *Norman Leslie*, a popular novel of the day, arrested attention by reason of its vigor, its sarcasm, its disclosure of a genuine gift for analysis and appraisal of literary values. The critic, it was evident, was not averse to the use of the keenest weapons, but used them for high purposes. He was bent on exposing literary pretension and on breaking the influence of mediocrity in American letters, and he rendered a genuine service to sound taste and therefore to the development of good literature by his critical work. He lacked the insight and sympathy of critics of the highest class, but he had wide acquaintance with the best in literature, rare power of analysis, and a very delicate sense of form. Above all, he was largely free from provincial prejudices and capable of judging a work of art on its merits. He recognized the genius of Hawthorne at the very start; he was quick to set its full value on Tennyson's early verse; he discerned the significance of Bryant, Lowell, and Cooper. His occasional failure to comprehend the spirit and method of a contemporary was most strikingly shown in his unfortunate attack on Longfellow, whom he accused of plagiarizing.

Poe had many opportunities, but his temperament made it impossible to establish comfortable and permanent working relations. In 1837, when a disastrous financial panic was at its height, he arrived in New York with very ambitious purposes, but with no resources. "The Narrative of Arthur Gordon Pym," published the following year, added nothing to his reputation and little to his income. The autumn of 1838 found Poe in Philadelphia, where he wrote two of his most characteristic pieces, "Silence" and "The Haunted Palace." The poem shows an ethical feeling which no other work from the same hand reveals. Two volumes made up of stories and sketches appeared in 1839 and contained some of the most original work which America has produced.

"The Fall of the House of Usher," "Ligeia," "William Wilson," and "Silence" exhibit Poe's power of invention, vividness of imagination, and skill as an artist at their best; and in perfection of form these prose pieces rank with "Israfel," "To Helen," and "The City in the Sea." To this period belong also those tales of ratiocination which are among the best of their kind and have borne fruit in an abundant harvest of similar or imitative stories. "The Gold Bug," "The Purloined Letter," "The Mystery of Marie Roget," and "The Murders of the Rue Morgue" are on a lower order of imagination than the tales of fantasy, but they are marvelous pieces of invention.

During this period Poe was undergoing the torture of uncertainty with regard to his wife, to whom he was affectionately devoted, and who was continuously and often desperately ill. Under this strain his power of resistance grew weaker, he yielded more easily and frequently to the craving for stimulants, and his unusual power of concentration gradually relaxed.

The position of editor of *Graham's Magazine*, in which he had revealed editorial ability of a high order, was given up or lost, and in 1844

Poe returned to New York with very little money and with a great sorrow impending in the near future. He was still, however, to achieve some of his most striking successes. In 1845 "The Raven," which gave him his immense popular reputation, appeared, and was followed by "The Bells" and "Ulalume." No American poems are more widely known, and in none is his marvelous command of the subtle resources of sound, his magical use of vowels, of repetition, of parallelism, so skillfully used to convey definite and striking effects. His collected poems were published at this time under the title, *The Raven, and Other Poems* (1845), and in the preface to the collection is a piece of autobiography. "Events not to be controlled," he wrote, "have prevented me from making at any time any serious effort in what, under happier circumstances, would have been the field of my choice." Early in 1846 he was living in a cottage at Fordham, near New York. (The "Poe cottage," moved from its original location to a small park, is being preserved as a memorial.) It was here, in January, 1847, that Poe's wife died. The poet, prostrated, was cared for by friends through a long illness, and finally recovered a degree of strength; but he was really a shattered man. He wrote "Eureka: A Prose Poem," marked by his characteristic inventiveness, put the finishing touches on "The Domain of Arnheim," and delivered a few lectures; but both his mind and his will bore traces of his great suffering. In June, 1849, he went to Richmond, where, ill as the result of excesses in Philadelphia, much kindness was shown him and he recovered something of his old spirit. Late in September he set out to return to New York. The story of the next few days never will be clearly told; but on an afternoon in the week following his departure from Richmond he was found in a drinking place in Baltimore, was taken unconscious to a hospital, and died four days later.

Of the three forms of Poe's literary activity his criticism, while of high importance at the time, is of least value; his prose tales have taken their place in the literature of the world by reason of their originality of motive and their finished art; while his poetry remains the most distinctive expression of his genius. In two important studies, "The Poetic Principle" and "The Rationale of Verse," he declared that truth gives expression to the intellect and passion to the heart, while beauty is the language of the soul. Beauty is, therefore, the highest form of creative activity; passion and truth are involved in it, but its chief aim is to produce a definite and convincing impression of its own nature by stimulating the imagination. He defined poetry as "the rhythmical creation of beauty," and laid down the law that beauty is essential to lyrical perfection in the phrase "a long poem does not exist." He held also that a marked quality of metre or rhythm should characterize all verse.

Bibliography. Numerous editions of Poe's work have appeared since his death. That of Griswold (2d ed., 4 vols., New York, 1856) is prefaced by a biography which later writers consider prejudiced to the point of calumny. The biography in the Stoddard edition (6 vols., new ed., New York, 1895) deprecates Griswold's extreme view, but is itself not free from bias. The Diamond edition (Boston, 1874) has a sketch by Gill. Later editions are by Ingram

(2d ed., 4 vols., Edinburgh, 1880; New York, 1894); the Virginia edition by Harrison, with notes by Stewart (17 vols., Boston, 1902), in which are included, in addition to the complete works of the poet, all the obtainable information as to his life and a full bibliography; and the edition by Stedman and Woodberry (10 vols., New York, 1908), scholarly and complete. Poe's *Tales* have been translated into French by Baudelaire and are in his *Œuvres complètes*, vols. v-vii (Paris, 1878-82). There are also German and Spanish translations. The *Poems* have been published in many editions. Of the numerous biographies, S. H. Whitman, *Edgar Allan Poe and his Critics* (New York, 1860), W. F. Gill, *Life of Edgar Allan Poe* (5th ed., ib., 1880), and J. H. Ingram, *Edgar Allan Poe: His Life, Letters, and Opinions* (2d ed., London, 1886), are answers to Griswold's assertions. There are essays by Baudelaire prefixed to volumes v and vi of his *Œuvres complètes*, above mentioned, and by Stedman, in *Poets of America* (New York, 1880). A selection from Poe's correspondence, edited by G. E. Woodberry, appeared in the *Century Magazine*, vol. xxvi (New York, 1894). The best critical *Life* is by Woodberry, in the "American Men of Letters Series" (Boston, 1885). Consult also: id., *Life of Edgar Allan Poe, Personal and Literary* (2 vols., ib., 1909); id., *Edgar Allan Poe*, in "Great American Authors" (ib., 1914); Oliver Leigh, *Edgar Allan Poe, the Man, the Master, and the Martyr* (Chicago, 1906); P. E. More, in *Shelburne Essays*, 1st series (New York, 1907); W. C. Brownell, in *American Prose Masters* (ib., 1909).

POE, ORLANDO METCALFE (1832-95). An American soldier and engineer, born at Navarre, Ohio. Graduating at West Point in 1856, he entered the corps of topographical engineers. In 1861 he served for a time as chief engineer of the Department of Ohio, but later was made colonel of the Second Michigan Volunteers, and in 1862 took part in the Virginia and Maryland campaigns. On November 29 he was made brigadier general of volunteers. The next spring he was transferred to the West as chief engineer of the Central District of Kentucky, and was Burnside's chief engineer during the defense of Knoxville (Nov. 18-Dec. 4, 1863), when he earned the brevet of major in the regular army. In 1864 he was appointed chief engineer of Sherman's army, participating in the invasion of Georgia and the campaign which ended with the surrender of Gen. J. E. Johnston. He received the brevet of brigadier general in the regular army in 1865 and was commissioned colonel of engineers in 1888. After the Civil War for a number of years Poe served as secretary of the United States Board of Lighthouse Commissioners and had charge of the construction of many important river and harbor works, among them the Spectacle Reef and Stannard Rock light-houses and the great lock on the Sault Ste. Marie. See CANAL.

PE'CILE (Lat., from Gk. ποικίλη, *poikilē*, variegated). The name given, because of the paintings that adorned it, to a famous *stoa*, or portico, in Athens, from which the Stoics (q.v.) were named.

POEL, pōl, WILLIAM (1852-). An English actor and theatrical manager, known for his presentations of old plays. A son of William Pole (q.v.), he altered the spelling of his own name. Having adopted the stage as a profession in 1876, five years later at St. George's Hall,

London, he revived *Hamlet*, with the text of the first quarto and without scenery. From 1881 to 1883 he was manager of Royal Victoria Hall, London, and then for a year stage manager of F. R. Benson's company. In 1895 the Elizabethan Stage Society was founded by him. Among the interesting revivals or first presentations under his management may be mentioned Shakespeare's *Measure for Measure* (1893) and *Two Gentlemen of Verona* (1910), plays by Marlowe and Ben Jonson, Milton's *Samson Agonistes* (1900), and Swinburne's *Lochner* (1900). These were given for the most part under the auspices of various societies. Poel also dramatized W. D. Howells's *A Foregone Conclusion* under the title *Priest and Painter* (produced 1884) and Baring-Gould's novel *Mehala* (produced 1886). He wrote several comediettas and a book, *Shakespeare in the Theatre* (1913). Consult C. E. Montagu, *Dramatic Values* (New York, 1911).

POEMA DE JOSÉ. See JOSÉ, POEMA DE.

POENULUS (Lat., the young Carthaginian). A comedy by Plautus, imitated from the *Kapxydovos* of Menander and produced in 189 B.C. The play contains a famous Phœnician passage in Latin characters.

POERIO, pò-a'rè-ò, ALESSANDRO (1802-48). An Italian poet and patriot. With his father, Barone Giuseppe Poerio (1775-1843), and his brother, Carlo Poerio (q.v.), he was exiled to Florence in 1815. Alessandro returned to Naples in 1818 and was one of the defenders of the new constitution. He served as a volunteer under General Pepe against the Austrians in 1821, but was again exiled when the Austrians entered Naples. He then studied in German universities; returned to Naples in 1835; and while again serving under General Pepe against the Austrians in 1848 was mortally wounded near Mestre. He published a number of lyrics, but is best known for his patriotic poem *Il resorgimento*. His verse was published as *Poesie edite e postume di Alessandro Poerio* (1852).

POERIO, CARLO, BARON (1803-67). An Italian patriot, brother of Alessandro Poerio. Born at Naples, he joined the Liberals of that city (1828) and took part in the conspiracy of Avellino, for which he was long in prison. He was concerned in the attempted revolution of 1847, but was discovered, and after the movement at Reggio was sent back to prison. The revolution which broke out at Palermo, Jan. 12, 1848, set him at liberty, and he immediately gave himself to the organization of the famous demonstration of Jan. 27, 1848, which brought about the constitution of February 10. Poerio was nominated director of police and Minister of Public Instruction, but he soon resigned. He was chosen Deputy to the Parliament. In 1849 he was sentenced to 24 years' imprisonment on a charge of conspiracy. In January, 1859, Poerio and other political prisoners were put aboard a vessel for transportation to South America. Transferred to an American ship, which landed them at Cork, they returned, by London, to Turin. In the following year Poerio was elected Deputy from Tuscany and took his seat in Parliament. When Garibaldi (q.v.) had driven out the Bourbon dynasty Poerio returned to Naples. He became a member of the Privy Council and subsequently vice president of the Parliament. He died at Florence.

POETASTER, THE. A comedy by Ben Jonson (1601), attacking Marston and Dekker, to which they retorted with *Satiromastix*.

POET AT THE BREAKFAST TABLE, THE. A series of essays and poems by Oliver Wendell Holmes, contributed to the *Atlantic Monthly* in 1871.

POETICS (Gk. *Περὶ Ποιητικῆς*, *Peri Poitikḗs*). A fragmentary treatise by Aristotle (q.v.) on the philosophy of art and especially of poetry. All we have of it (and possibly all that ever was written) is the discussion of epic poetry and the tragic drama, fortunately enriched with many allusions to the other arts; but, restricted as it is, this treatise is unquestionably the most important work on criticism ever written, intrinsically as well as historically. Consult S. H. Butcher, *Aristotle's Theory of Poetry and Fine Art, with a Critical Text and Translation of the Poetics* (3d ed., New York, 1903).

POET LAUREATE. See LAUREATE, POET.

POETRY. See literatures of the various nations, as ENGLISH, FRENCH, GREEK, ITALIAN, PROVENÇAL, ETC.; also BALLAD; BALLADE, BLANK VERSE; DIDACTIC POETRY; EPIC POETRY, EPIGRAM, LYRIC POETRY; MADRIGAL; MEISTER-SINGER, MINNESINGER, MINSTREL; PASTORAL POETRY; RHYME; SONNET; TROUBADOUR; VERIFICATION. Also individual poems such as BEOWULF; EDDA; MAHABHARATA; NIBELUNGEN-LIED; ROLAND; VEDA.

POETRY, SPASMODIC SCHOOL OF. A name sometimes applied to certain English authors of the nineteenth century whose writings are strained and unnatural in style. Of this class the best known are Philip James Bailey, Alexander Smith, Sydney Dobell, and Gerald Massey (qq.v.).

POETS' CORNER. The popular name given to a part of the south transept of Westminster Abbey containing the tombs and memorials of a number of Englishmen eminent in letters. The memorials include those of Chaucer, Dryden, Milton, Shakespeare, Spenser, Addison, Ben Jonson, Macaulay, Wordsworth, and the American, Henry W. Longfellow.

POEY Y ALOY, pò'á è à-loi', FELIPE (1799-1891). A Cuban naturalist, born in Havana. For a time he practiced law in Madrid. In 1826 he went to Paris, where he studied zoology and aided in founding the Entomological Society of France. In 1833 he returned to Havana and devoted himself to the study of Cuban fauna, particularly fishes, of which he discovered many new species. From 1842 till his death he was professor of comparative anatomy and zoology at the University of Havana. The most important of his publications are: *Memorias sobre la historia natural de la Isla de Cuba* (2 vols., 1851-61); *Reportorio fauno-natural de la Isla de Cuba* (2 vols., 1865-68); *Enumeratio Piscium Cubensium* (1875). His greatest work, *Ictiologia Cubana*, in manuscript at the time of his death, describes 782 species of fish, nearly half which number were made known by him.

POGE, CAPE See CAPE POGE

POGGE, pò'ge, PAUL (1839-84). A German explorer of Africa, born at Ziersdorf in Mecklenburg. In 1874 he joined Alexander von Homeyer's expedition, and in December of 1875 alone reached Musamba, the capital of Muata Jamvo, the farthest point inland reached at that time by an explorer of the German Company. In 1880, with Wissmann, he set out to explore the southern basin of the Congo. They separated at Nyangwe in 1882, and Pogge established a station near Mukenge. He died at Loando just

as he was starting back to Europe. He wrote *Im Reiche des Muata Jemoo* (1880).

POGGENDORFF, pög'gen-dörf, JOHANN CHRISTIAN (1796-1877). A German physicist, chemist, and editor. He was born at Hamburg, studied pharmacy, chemistry, and physics, and was connected with the University of Berlin from 1830 until his death, serving as professor from 1834. In 1838 he became a member of the Berlin Academy of Sciences. His chief discoveries were in connection with electricity and magnetism, but he is best known perhaps for the fact that from 1824 to 1876 he edited the *Annalen der Physik und Chemie*. This journal carried out Poggendorf's original idea, though it was a continuation of (L. W.) Gilbert's *Annalen der Physik*; Poggendorf succeeded to the editorship after Gilbert's death. In connection with Liebig and Wohler he prepared the *Handwörterbuch der Chemie* (Brunswick, 1837-51). He also published the *Lebenslinien zur Geschichte der exakten Wissenschaften* (1853) and *Biographisch-literarisches Handwörterbuch zur Geschichte der exakten Wissenschaften* (2 vols., 1858-63), subsequent editions of which have been issued, the fourth appearing in 1904. The *Geschichte der Physik*, edited by W. Barenten, was published in 1879. Consult Emil Frommel, *Johann Christian Poggendorff* (Berlin, 1877).

POGGIO BRACCIOLINI, pöd'jō brä'chō-lē'nē, GIOVANNI FRANCESCO (1380-1459). An Italian scholar and author of the Renaissance. He was born at Terranuova, near Florence, and after studying Latin under Giovanni da Ravenna and Greek under Manuel Chrysoloras, became a copyist of manuscripts. His skill in that pursuit attracted the attention of the leading Florentine scholars, and at the age of 22 he entered the service of Pope Boniface IX as Apostolic Secretary. He served in the same capacity under the seven succeeding popes (1404-53), attended the Council of Constance in 1414, and was present at the trial and martyrdom of Jerome of Prague, of which he wrote an almost sympathizing account. For the most part, however, he seems to have cared little for the important political and ecclesiastical movements of the period, and is remembered chiefly for his persevering and successful researches in various European monasteries where masterpieces of classic literature were lying unknown. Among the manuscripts he thus recovered were those of Quintilian (complete), the great philosophic poem of Lucretius, *De Rerum Natura*, 7 orations of Cicero, 12 plays of Plautus, the commentaries of Asconius Pedianus, the history of Ammianus Marcellinus, parts of Petronius and of Livy, the *Dialogus* and the *Germania* of Tacitus, the *Silvæ* of Statius, the oration *Pro Cæcina* of Cicero, and the fragment of Suetonius, *De Grammaticis et Rhetoribus*. Among his own works, all of which are in Latin, are a collection of *Letters* (1437); various moral essays, including *De Nobilitate*, *Dialogus* and *De Varietate Fortunæ*; *Historia Florentina*, written in imitation of the style of Livy; and his most famous work, *Liber Facetiarum* (ed. by I. Liseur, Paris, 1878), a collection of violent and often indecent diatribes against the monks and the clergy. The most scurrilous are those against Valla (q.v.) and Filelfo, with whom he was engaged in a long and bitter controversy. His works contain lively descriptions of the life and customs of various European countries and valuable notes on the remains of antique art in Rome. He spent his

last years at Florence, where he was chosen chancellor and historiographer. The material for the collection of French tales *Cent nouvelles nouvelles* (q.v.) was taken in part from the works of Poggio. His statue in the cathedral of Florence is the work of Donatello. Consult: Symonds, *The Renaissance in Italy*, vol. i (London, 1875); J. E. Sandys, *Harvard Lectures on the Revival of Learning* (Cambridge, 1905); id., *A History of Classical Scholarship*, vol. ii (ib., 1908); H. T. Peck, *A History of Classical Philology* (New York, 1911), with the notes; Wilmann, *Ueber die Briefsammlungen des Poggio Bracciolini* (Leipzig, 1913). See RENAISSANCE.

POGO'DIN, MIKHAIL PETROVICH (1800-75). A Slavophile Russian historian and archaeologist. Appointed professor at the Moscow University in 1830, he resigned in 1844 to devote himself to literature and the study of archaeology. His collection of Russian antiquities was bought by the government. He published in 1841-56 a literary and political periodical called the *Moskovite*, in which he advocated Pan Slavism. His efforts in various kinds of literature are now of little importance. Several monographs on special periods of Russian history, with his unfinished *Russian History* (7 vols., 1846-59), which is important for the material gathered, are his chief works of value.

POGO'NIA. See ORCHID.

POGROM, pō-grōm'. The name given anti-Jewish riots in Russia. The first pogroms took place in 1881 after the assassination of Alexander II by the revolutionists, and were organized by a secret society which the officials of the government encouraged, hoping to turn the discontent of the people with political conditions into the channels of race hatred. The pogroms of 1881 were the direct cause of the first large wave of Russian-Jewish emigration to the United States. The policy of organizing such riots was not renewed till 1903, when the massacre of Kishinev in the Province of Bessarabia took place. This was the first demonstration in which blood was shed, about 50 Jews being killed and several hundred wounded. After the manifesto of Oct. 17 (30), 1905, a series of pogroms was organized throughout the Pale of Residence by the counterrevolutionary and reactionary forces; their organized and governmental character has been partially proved by various investigations and by the publication of secret government documents. It is estimated that at this time Jews were attacked in more than 600 cities, villages, and towns; the number of killed, wounded, and tortured was several thousand, while the property damage exceeded 50,000,000 roubles. The Jews were overwhelmed by the calamity, and hundreds of thousands of them left Russia for the United States, South America, Africa, and Palestine. Yet they did not all suffer passively, in many cases organizing leagues for self-defense.

POGY, pō'gi or pōg'i. The menhaden (q.v.).

POHL, pōl, HUGO (1855-1916). A German naval officer, born at Breslau. He became a lieutenant in the navy in 1876, commanded the corvet *Carola* in 1887, was promoted to commander in 1894 and to captain in 1898, and during the bombardment of the Taku forts in China in 1900 commanded the cruiser *Hansa*. He became a commodore in the new navy in 1905 and a vice admiral in 1909. Subsequently Pohl became a full admiral and chief of the admiralty staff, and during the War in Europe (q.v.)

succeeded Admiral von Ingenohl in the command of the German battle fleet (Feb. 27, 1915).

POHL, RICHARD (1828-96). A German writer on music. He was born in Leipzig, studied at Chemnitz and Karlsruhe, at Göttingen and Leipzig, taught in Graz, and then devoted himself to music, living in Dresden (1852-54), in Weimar (1854-63), and in Baden-Baden from 1863 till his death. He edited the *Badeblatt* and (1856-60) *Anregungen für Kunst und Wissenschaft*. His musical critiques, some of which were published under the name *Hoplit*, did much to further the cause of Wagner and Liszt. Pohl's chief works include: *Akustische Briefe* (1853); *Baireuther Erinnerungen* (1877); *Autobiographisches* (1881); *Richard Wagner* (1883); *Franz Liszt* (1883); *Hektor Berlioz* (1884); *Die Höhenzüge der musikalischen Entwicklung* (1888), as well as poems.

POL. A fermented food product made from the starchy root of the taro, *Colocasia antiquorum*. It is very popular in the Hawaiian Islands. It is also the name of a popular Maori action song. See COCCO; TARA; TARO.

POINCARÉ, PWÂN'ká'rá', (JULES) HENRI (1854-1912). A French mathematician and physicist, born at Nancy, April 29, 1854. He entered the Ecole Polytechnique in 1873, but left it two years later to take up work in the Ecole Supérieure des Mines. He became an engineer in 1879 and in the same year doctor of sciences. In 1881 he was called to Paris, where in 1886 he became professor of mathematical physics and calculus of probabilities in the Faculty of Sciences. At the death of Tisserand (1896) he changed this chair for that of celestial mechanics. In 1887 he was made member of the Académie des Sciences at Paris, and in 1908 was elected to the Académie Française. In 1885 he received the Prix Poncelet and in 1889 obtained the prize awarded by King Oscar of Sweden for a work on the problem of the three bodies (q.v.). He received also the Prix Reynaud in 1896, the gold medal of the Royal Astronomical Society in 1900, the Sylvester medal of the Royal Society in 1901, the gold medal of the Lobachevsky Fund in 1904, the Prix Bolyai in 1905, and the gold medal of the Association Française pour l'Avancement des Sciences in 1909. He was a member of most of the great learned societies of the world and was connected with various scientific journals. Poincaré was one of the greatest mathematicians produced by France in the nineteenth century. A disciple of Cauchy, he carried out the investigations of the latter along the various lines of the theory of functions, and he applied his remarkable mathematical powers to profound researches in the domain of physics. He introduced into mathematics a new class of transcendents, analogous to, but more general than, the elliptic functions, which he named the Fuchsian functions in honor of Immanuel Fuchs (q.v.). He introduced also in connection with these functions a new class of groups, also called Fuchsian. He contributed to the theory of non-Euclidean geometry, to the theory of differential equations, and to various branches of higher algebra. Poincaré died in Paris, July 17, 1912. He was a cousin of Raymond Poincaré.

His works include: *Leçons sur la théorie mathématique de la lumière* (2 vols., 1889-92); *Electricité et optique* (2 vols., 1890-91); *Thermodynamique* (ed. by Blondin, 1892); *Leçons sur la théorie de l'élasticité* (ed. by Borel

and Drach, 1892); *Les méthodes nouvelles de la mécanique céleste* (3 vols., 1892-99); *Théorie des tourbillons* (1893); *Les oscillations électriques* (ed. by Maurrain, 1894); *Capillarité* (ed. by Blondin, 1895); *Théorie analytique de la propagation de la chaleur* (ed. by Rouyer and Baire, 1895); *Calcul des probabilités* (ed. by Quiquet, 1896); *Cinématique et mécanismes potentiels et mécanique des fluides* (ed. by Guillet, 1899); *Théorie du potentiel Newtonien* (ed. by Le Roy and Vincent, 1899). Part of these works form his *Cours de physique* (13 vols., 1890). In addition to the foregoing works he published important memoirs on mathematics and physics in the *Journal des mathématiques pures et appliquées*, the *Journal de l'Ecole Polytechnique*, the *Transactions of the Philosophical Society of Cambridge*, *Scientia*, the *Acta Mathematica*, the *Mathematische Annalen*, and many other leading mathematical journals. Consult various biographical sketches in the scientific journals of 1913; also E. E. Slosson, *Major Prophets of To-Day* (Boston, 1914).

POINCARÉ, LUCIEN (ANTOINE) (1862-). A French physicist and educator, brother of Raymond Poincaré. He was born at Bar-le-Duc (Meuse) and was educated there and in Paris at the Ecole Normale Supérieure and the university (D.Sc.). From 1886 to 1893 he taught in lycées, then (as professor) at the Ecole Normale, Sèvres (1894-1900), and in the Faculty of Sciences, Paris (1899-1900). In 1902 he became inspector general of public instruction. Besides contributions to the scientific press Poincaré wrote *La physique moderne, son évolution* (1906; Eng. trans., *The New Physics and its Evolution*, 1907) and *L'Electricité* (1907; Eng. trans., *Electricity Present and Future*, 1908).

POINCARÉ, RAYMOND (1860-). A French statesman and writer. He was born Aug. 20, 1860, in Bar-le-Duc, Lorraine, of a distinguished family of lawyers and scientists, his brother Lucien being a physicist and his cousin Henri the noted mathematician and physicist. Educated early at the lycées of Bar-le-Duc and Louis-le-Grand, he later made a brilliant record as a law student in Paris. For some time he practiced his profession and contributed to political journals, especially the *Voltaire* and the *République Française*. At the age of 27 he was elected to the Chamber of Deputies, where he became a follower of M. Méline, the moderate Republican. During the Dreyfus affair his attitude was not quite clear. Although a staunch Republican, he was opposed to the Radical bloc organized by Waldeck-Rousseau, and particularly opposed to the latter's work in separating church and state. In 1893 he was made Minister of Public Instruction and in 1894 Minister of Finance. Again and again in various ministries he held one office or another, but it was as Minister of Finance that he particularly distinguished himself. In 1903 he was elected to the Senate, where his moderate views were more acceptable than in the Chamber of Deputies. Upon his appointment as Prime Minister in 1912 Poincaré assumed also the portfolio of Foreign Affairs, which department was in a critical condition because of the Morocco affair with Germany. As Premier he became a vigorous supporter of the alliance with Russia and of the entente with England. His ministry also committed itself to electoral reform on the principle, warmly espoused by the

Premier, of proportional representation. Largely through his influence a bill establishing proportional representation passed the Chamber (1912), but was defeated in the Senate.

In January, 1913, M. Poincaré was elected ninth President of the Republic, succeeding Armand Fallières. His election, heralded as a victory for militant nationalism, was particularly pleasing to the Czar, who sent a telegram of warm congratulation. The knowledge that for the first time a really strong man held the presidency of the Third Republic aroused the apprehension of the veteran Republicans, who feared, or pretended to fear, the destruction of the Republic by a coup d'état. M. Poincaré, believing that the President should become "a more trusted and more important magistrate" and not merely a figurehead, made himself the most influential person in the conduct of the government, particularly in foreign affairs. The three-year military service bill (see FRANCE, *History*), introduced by the Barthou ministry in 1913, had the firm support of the President, and in spite of bitter opposition to the measure on the part of Socialists and Radicals it was enacted into law. He was also assiduous in cultivating good relations with Russia and England; on his visits to St. Petersburg and London he was enthusiastically received by the people.

At the outbreak in 1914 of the War of the Nations (see WAR IN EUROPE) M. Poincaré made an impassioned appeal to the Chamber, and war supplies were voted unanimously. The Viviani cabinet, so reorganized as to include representatives of every party, formed, with the President, a sort of committee of public safety. By his brilliant oratory Poincaré was most successful in his efforts to rouse the country to a high and sustained pitch of patriotism. He had become known also as an accomplished writer, and was admitted to the French Academy in 1909. By the students of Glasgow University he was elected lord rector in 1914. His writings include: *Idées contemporaines* (1906); *Questions et figures politiques* (1907); *Causes littéraires et artistiques; Ce que demande la cité* (1912; Eng. trans., *How France is Governed*, 1913), a clear explanation of the organization and activities of the French government. Consult Charles Dawbarn, *Makers of New France* (New York, 1915), and the anonymous *Raymond Poincaré: A Sketch* (ib., 1915); W. M. Fullerton, *Four French Statesmen* (Boston, 1915).

POIN'CIANA. See CÆSALPINIA.

POIN'DEXTER, GEORGE (1779-1853). An American statesman, born in Louisa Co., Va. He began the practice of law in Milton, Va., but in 1802 went to the Mississippi Territory, of which in 1803 he was appointed Attorney-General. In 1806, he was a member of the Territorial Legislature, and the next year he conducted the prosecution of Aaron Burr (q.v.). Then for two terms (1808-12) he was a delegate to the national House of Representatives. In 1813 he was appointed United States judge of the Territory, in 1817 he presided over the committee to prepare a constitution for the State, and, chosen the State's first Representative in Congress, he distinguished himself by his defense of General Jackson's course in Florida. In 1819 he was chosen Governor and while in office prepared *The Revised Code of Law of Mississippi* (1824). In 1830 he was appointed and then elected to fill out an unexpired term as United States Senator. Meanwhile his admira-

tion for General Jackson had cooled, and he was even suspected of complicity in the attempt to assassinate the President. Much to the surprise of his constituents, Poin Dexter voted for Clay's resolution of censure for the President on account of the removal of deposits from the Bank of the United States. In 1835 he was defeated for reelection. Though a man of great ability, he was yet violent, arrogant, and obstinate. As a result of one of his quarrels he killed Abijah Hunt in a duel (1811), in which he was accused of firing before the word, though the charge never was proved.

POINDEXTER, MILES (1868-). An American lawyer and legislator, born in Memphis, Tenn. He was educated at Washington and Lee University, from which he was graduated in law in 1891. He settled in Walla Walla, Wash., where, in 1892, he was elected prosecuting attorney on the Republican ticket, and after moving to Spokane in 1897 he was assistant prosecuting attorney there (1898-1904) and judge of the Superior Court (1904-08). Poin Dexter became widely known as a progressive Republican. In 1908 he was elected to Congress, where he affiliated himself with the insurgents and took a prominent part in the overthrow of Speaker Cannon in 1910. In the latter year he was successful as a candidate in the primary election for United States Senator from Washington—a choice ratified by the Legislature. In 1912 he supported Roosevelt, and for a time was the only representative of the Progressive party in the Senate.

POINDING, pind'ing (from *poind*, Scottish dialectic form of *pound*; connected with AS. *gepyndan*, Eng. *bind*, to shut up, impound, and with *pond*). In Scots law, a method of satisfying a claim, under process of law, by seizing and selling the debtor's goods. Where a creditor has a claim which is considered a lien or burden on land, he may obtain a writ or warrant, known as a *debitum fundi*, authorizing the attachment and sale of such movables (q.v.) or chattels on the land as belong to the debtor. This is called real poinding. Personal poinding, or seizing any other personal goods of a debtor, is authorized by a special writ issued by an inferior judicial officer. Beasts of burden, plow animals, and agricultural implements cannot be seized until all other goods of the debtor are exhausted. The proceedings for the collection of debts above described correspond to the English and American processes of attachment, execution, and distress. See ATTACHMENT; DISTRESS; EXECUTION.

POIN'SETT, JOEL ROBERTS (1779-1851). An American diplomatist and cabinet officer, born in Charleston, S. C. He studied medicine at Edinburgh and military science at Woolwich, and then law, and traveled extensively through Europe and Asia. In 1809 he was sent as United States Commissioner to South America to investigate the chances for independence of the revolting colonies. While he was in Chile the Spanish authorities of Peru, hearing that war had been declared against the United States by Spain, seized American merchantmen, but were forced by Poinsett at the head of Chilean soldiers, who had been put under his command by the Republic, to return them with apologies. While a member of the South Carolina Legislature Poinsett strongly advocated internal improvements. From 1821 to 1825 he sat in the United States Congress as a Fed-

etalist (see **FEDERALISTS**), and urged that assistance be sent to the South American republics. In 1822 he had been sent as special Minister to Mexico, and from 1825 to 1829 was Minister to that country. When the issues of nullification (q.v.) came to the front in South Carolina (1830-32) he became prominent in the Union party and opposed the idea of nullification vigorously. From 1837 to 1841 Secretary of War in Van Buren's cabinet, he secured (in 1840) the passage of the militia reorganization bill. He wrote many orations and essays and founded an academy of fine arts in Charleston. He published *Notes on Mexico, Made in 1822; with an Historical Sketch of the Revolution* (1824).

POINSETTIA. A species of Euphorbia. See **SPURGE**.

POINSOT, EDMOND-ANTOINE. See **HEYLLI**, **GEORGES D'**.

POINSOT, pwān'sō', LOUIS (1777-1859). A French mathematician. He was born in Paris and studied civil engineering at the Ecole Polytechnique in 1794-96. In 1804 he became professor of mathematics at the Lycée Bonaparte, and after 1809 was a member of the faculty of the Ecole Polytechnique. Poinso was a member of the Academy of Sciences, the Superior Council of Public Instruction, and the French Senate, and an Officer of the Legion of Honor. His more important works include *Eléments de statique* (1803; 9th ed., rev., 1848) and *Théorie nouvelle de la rotation des corps* (1834; Eng. trans. by Charles Whitley, *Outlines of a New Theory of Rotatory Motion*, 1834).

POINT. See **HERALDRY**.

POINT. Euclid (q.v.) defined a point as "that which has no part," a definition carelessly modified by Capella (c.475) and some others into "punctum est cuius pars nihil est." Long before this the Pythagoreans had defined a point as a "monad having position." Various other definitions have been given, no one of them being satisfactory, for the reason that the term is too elementary to permit of a good definition. For the historic efforts that have been made to define the term, consult T. L. Heath, *The Thirteen Books of Euclid's Elements*, vol. i (New York, 1908).

POINT BARROW. The northernmost cape of Alaska, in lat. 71° 25' N., long. 156° 20' W. (Map: Alaska, G 1). This is the most northerly inhabited part of the continent of North America and is the land base for whaling in the adjacent Arctic Ocean. It has a post office, a physician, and a school with more than 100 Eskimo pupils. The natives in the neighborhood have reindeer herds numbering about 2000 head. The population, somewhat shifting, averages 500.

POINT D'ALENÇON. See **LACE**.

POINT D'ANGLETERRE. See **LACE**.

POINT D'APPUI, pwān' dāp'pwē' (Fr., point of touch). In military tactics, one of the points previously agreed upon where troops may rally or rendezvous after an extended or scattered movement. In attack formation it may be the point, or points, from which the actual attack is begun.

POINT DE GALLE, pwān de gāl, or **GALLE**. The oldest commercial port of Ceylon, situated at the southwestern end of the island, 56 miles southeast of Colombo (Map: India, D 8). It lies at the foot of a range of rocky hills and is well laid out. The European town, inclosed by fortifications constructed during the Dutch occu-

pation, contains a fine church and many other public buildings. The town has a good harbor, but has lost its former commercial importance. Point de Galle is the seat of a United States consular agency. The town was taken by the Portuguese in 1518 and attained commercial importance on account of the cinnamon monopoly. In 1642 it came into the hands of the Dutch, by whom it was strongly fortified. It passed to Great Britain in 1796. Pop., 1901, 37,326; 1911, 39,960.

POINTE-À-PITRE, pwān'ta'pē'tr'. The principal seaport and largest town of the French West Indian island of Guadeloupe, situated about 20 miles northeast of the capital, Basse-Terre (Map: West Indies, G 3). It is a new town, built on the site of an old town destroyed by earthquake (1843) and by fire (1871), and is surrounded by a marshy district. It has a cathedral and a museum. It exports cocoa, sugar, and vanilla. Pop. (est.), 18,942.

POINTED STYLE. A name used by some writers to designate Gothic architecture (q.v.) in general as distinguished from the preceding Romanesque or round-arched style. The name is based upon the forms of the arches which characterize European medieval architecture from about 1150 to 1500, but as pointed arches are characteristic of most of the Mohammedan styles also, the name has not been generally adopted in place of the more common though unscientific term, Gothic.

POINTER. A dog. See **FIELD DOG**.

POINT LEVI, lā-vē'. A river port in Quebec, Canada. See **LEVIS**.

POINT PLEASANT, BATTLE OF. In American history, a battle fought Oct. 10, 1774, at the mouth of the Great Kanawha River, in Virginia (now West Virginia), between about 1100 Virginians under Andrew Lewis and about 1000 Indians under the Shawnee chief Cornstalk, the former gaining a decisive victory, which closed Lord Dunmore's War. Lewis had arrived at this point on October 6 and had encamped to await the coming of Lord Dunmore, who was to join him with a force of 1000. Early on the tenth, however, Lord Dunmore having appointed another rendezvous, Lewis was preparing to cross the Ohio, when he was suddenly attacked by the Indians. After a fierce contest, lasting all day, each side fighting, Indian fashion, behind trees and boulders, the whites finally won. The battle has been regarded as one of the most stubborn and evenly contested ever fought between Indians and white men. The loss of the whites was 75 killed and 150 severely or slightly wounded, Col. Charles Lewis being among the former. The Indians lost not more than half as many; about 40 warriors were killed outright or died of their wounds. Accounts of the killed and wounded, however, vary greatly. The victory forced the Indians to make a treaty relinquishing to the whites a large tract of land south of the Ohio, while it kept the northwestern tribes relatively quiet during the early part of the Revolution, threw open the Ohio route to Kentucky, and inspired the pioneers with renewed confidence. There is little historic basis for the claim, frequently made, that this should be regarded as the first battle of the Revolutionary War. Consult Theodore Roosevelt, *Winning of the West*, vol. i (new ed., New York, 1900).

POINTS OF THE ESCUTCHEON. See **HERALDRY**.

POIRÉ, pwa'rá', EMMANUEL (1858-1909). A French caricaturist, better known by his pen name, Caran d'Ache (Russian for "pencil"). He was born in Moscow, Russia, and was mainly self-taught in art. His first drawings, military caricatures, mostly of the German army, were published in *La Vie Militaire*, *Le Chat Noir*, and other publications. His *Epopée*, a series of *ombres chinoises* depicting the soldiers of Napoleon, established his reputation. Caran d'Ache is best known, however, for his spirited and amusing "stories without words," illustrating French political and social life. These appeared in *Tout Paris*, *Vie Parisienne*, *Le Figaro*, and *Le Rire*. His drawings have also been gathered in albums, such as *Psst* (1898), which contains his Dreyfus sketches; *Le carnet de chèques*, dealing with the Panama scandals; *Courses dans l'antiquité*; *Les lundi*; *Découverte de la Russie*. His illustrations include those made for *La comédie du jour* of Millaud.

POIRIER, pwa'ryá', PASCAL (1852-). A Canadian legislator and author. He was born at Shediac, New Brunswick, and was educated at St. Joseph's College, Memracook. He was called to the Quebec bar in 1877 and to the New Brunswick bar in 1887. In 1885 he was made a Conservative member of the Dominion Senate. Poirier became a leader and spokesman of the Acadians, the descendants in Nova Scotia and New Brunswick of the French colonists that were not expelled from Acadia in 1755. He was admitted to the French Legion of Honor and was elected a fellow of the Royal Society of Canada. He published: *L'Origine des Acadiens* (1887); *Le Père Lefebvre et l'Acadie* (1891); *Des Acadiens déportés à Boston, en 1775* (1909); *History of the Maritime Provinces from the Acadian Point of View* (1914). See HANNAY, JAMES (1842-1910); NOVA SCOTIA, *History*.

POISON (OF., Fr. *poison*, from Lat. *potio*, drink, potion, from *potare*, to drink). In law, any substance which, if taken or injected into the human body, may cause serious bodily harm or death. In most States the sale of poisons is regulated by statute, especially of such as are known as habit-forming drugs. Common regulations are to require bottles or other receptacles containing poison to be plainly labeled "Poison," in addition to the scientific name of the drug, and to prohibit druggists from retailing certain poisons without physicians' certificates or prescriptions for their use. Physicians may administer poisons as medicines in their discretion. Consult the authorities referred to under CRIMINAL LAW; MEDICAL JURISPRUDENCE; ETC. See ANTIDOTE; CRIME; POISONING.

POISON ALDEE. See SUMAC.

POISONING. The crime of administering poison to a human being or to a domestic animal with intent to cause death or bodily harm. It is a felony in the United States as well as in England to administer or to attempt to administer poison to another with intent to commit serious bodily harm, or to use chloroform, laudanum, or any stupefying or overpowering drug on another with intent to commit an indictable offense. To administer poison to another with intent to injure, aggrieve, or annoy him is usually classed as a misdemeanor. See ABORTION; RAPE.

The use of poison or of poisoned weapons in war is frowned upon by international law (see Hague Regulations, 23 a), but poisonous

gases were freely used in the European War (1914 et seq.). See POISON.

POISONING, ANILINE. See ANILINE POISONING.

POISONING, FORAGE. See MENINGITIS, *Cerebrospinal Meningitis*.

POISON IVY. See IVY; IVY POISONING; SUMAC.

POISON OAK (*Rhus toxicodendron* and *Rhus quercifolia*). American shrubs and vines, feared because of their poisonous qualities, said to be caused by a nonvolatile oil which produces itching, reddening, and swelling of the skin of certain individuals but not of others. Saturated alcoholic solution of lead acetate (sugar of lead) is recommended as an antidote. The fluid extract of *Grindelia robusta* also has some repute for the treatment of poison-ivy poisoning. See IVY; IVY POISONING; SUMAC.

POISON OF SERPENTS. See RATTLE-SNAKE; SNAKE; VIPER.

POISONOUS INSECTS. See INSECT, *Poisonous Insects*.

POISONOUS PLANTS. Plants containing poisonous substances in sufficient amounts to render them injurious when eaten or touched by men or animals. There is, however, no sharp line of distinction between poisonous and non-poisonous plants. Many harmless plants, even some of our most wholesome food plants, like the potato, contain traces of substances which in a concentrated extract are violent poisons. Others, though really harmless unless eaten in immoderate quantities, are or have been popularly reputed to be poisonous. There are, however, a number of plants of which moderate doses are known with certainty to produce injurious or even fatal results. A botanical classification of these would scarcely be convenient, as they are scattered nearly throughout the vegetable kingdom. Yet it is a noticeable fact that certain natural families are especially rich in poisonous members, the active principles of which are characteristic of the family. Thus, nearly all members of Solanaceæ and Papaveraceæ contain narcotic alkaloids; convulsive and cardiac neurotic poisons are characteristic of the Apocynaceæ and Loganiaceæ; prussic acid is frequent in the seeds and foliage of some Rosaceæ; oils and acids producing cutaneous irritation are characteristic of the Anacardiaceæ, Euphorbiaceæ, and Urticaceæ; the Iridaceæ, Liliaceæ, Ranunculaceæ, Leguminosæ, Umbellifereæ, and Cucurbitaceæ are also notable for their poisonous members. The foliage and green parts of many plants, as sorghum, certain beans, cherry, elderberry, currants, etc., contain glucosides that yield hydrocyanic acid, a deadly poison.

The poisonous members of the Anacardiaceæ, such as the poison sumac and poison ivy, are the most important of the plants that are poisonous to the touch; many of the others are poisonous only when eaten. Of these some contain the active principle chiefly in the fruit or seed, such as belladonna, bittersweet, stramonium, poke, henbane, strophanthus, nux vomica, etc.; in others, such as water hemlock and aconite, it is concentrated chiefly in the roots or tubers, though in hemlock, as in many other cases, every part of the plant is almost equally poisonous. In such plants as ailanthus, kalmia, larkspur, and wild cherry, the foliage is especially poisonous and is often fatal to live stock. For further particulars, see the article FUNGI,

EDIBLE AND POISONOUS. Consult: V. K. Chestnut, "Thirty Poisonous Plants of the United States," in *United States Department of Agriculture, Farmers' Bulletin*, No. 86 (Washington, 1898), and L. H. Pammel, *Manual of Poisonous Plants, Chiefly of Eastern North America* (2 vols., Cedar Rapids, 1910-11).

POISONS. See ANTIDOTE, TOXICOLOGY.

POISON SUMAC. See DOGWOOD

POISSON, pwā'sōn', ADOLPHE (1849-). A Canadian poet, born at Gentilly, Province of Quebec, and educated at the Quebec Seminary and at Nicolet College. He studied law and was called to the bar in 1873, and, although he chose literature as a profession, was appointed registrar of Arthabaska County in 1873 and became president of the Provincial Registrars' Association in 1894. He was elected a fellow of the Royal Society of Canada and president of its literary section. His poetical works are: *Chants Canadiens* (1880); *Heures perdues* (1894); *Sous les pins* (1902); *Le sommeil de Montcalm* (1910). Consult Camille Roy, "French-Canadian Literature," in *Canada and its Provinces* (Toronto, 1913-14).

POISSON, JEANNE ANTOINETTE. See POMPADOUR, MARQUISE DE

POISSON, SIMÉON DENIS (1781-1840). A French mathematician, physicist, and astronomer. He early took up the study of the descriptive geometry of Monge. At the age of 17 he entered the polytechnic school at Paris, where he soon attracted the attention of his instructors, notably of Lagrange. He held various positions as examiner and professor in this institution for nearly 40 years. He was also professor of mechanics in the Faculty of Sciences, member of the Bureau of Measures, and member of the Council of Public Instruction (1820). He was made Baron by Napoleon and in 1837 became a peer. His scientific works and memoirs number over 300 and are devoted to mathematics, physics, and astronomy. The work enjoying the widest circulation is his *Traité de mécanique* (2 vols., 1811; 2d ed., 1833; Ger. trans., 1835-36). His other notable works are *Théorie mathématique de la chaleur* (1835; supplement 1837) and *Recherches sur la probabilité des jugements en matière criminelle et en matière civile* (1837). His important memoirs on definite integrals and their applications to physics, on calculus of variations, and on probability were published in *Journal de l'Ecole Polytechnique* (1802-39); *Mémoires de l'Académie* (1811-43); *Connaissance des Temps* (1819-27); and in numerous other journals. Arago's works, volume ii, contain a complete list of Poisson's productions.

POISSON BLEU. See GRAYLING.

POISSY, pwā'sé'. A small town of France, in the Department of Seine-et-Oise, situated 10 miles northwest of Paris (Map: France, N., G 4). It has the fine church of Notre Dame, which is one of the best examples of the transition style of the twelfth century. Poissy is the birthplace of St. Louis (1215), and here in 1561 a famous religious conference was held between Roman Catholics and Protestants. The town has important iron foundries. Pop., 1901, 7506; 1911, 8709.

POITIERS, pwā'tyá'. The capital of the Department of Vienne, and formerly of the Province of Poitou, in west France. It is situated on a plateau-like peninsula formed by the junction of the Clain and the Boivre rivers and on the

Orléans Railroad, 58 miles southwest of Tours (Map: France, N., F 6). It is an old town with narrow, crooked, and ill-paved streets. Although it is a railroad junction, its commerce and industries are not very important; it is interesting chiefly on account of its ancient and mediæval remains and associations. It is preëminently a city of churches and ecclesiastical institutions. The cathedral of St. Pierre is a Gothic-Romanesque structure of the twelfth century. There are several very old and interesting churches, such as the Temple St. Jean, a baptistery built in the seventh century and one of the oldest Christian monuments in France; the church of Notre Dame la Grande, a Romanesque building of the eleventh century; and the church of Ste. Radegonde, founded in 580, rebuilt in the eleventh century. Among the noteworthy buildings and places are the fine modern hôtel de ville and the Parc de Blossac, the latter, situated at the south end of the town, is bordered by mediæval ramparts and commands a fine view. At the north end, near Pont Joubert, is a colossal gilded statue of Notre Dame des Dunes. Poitiers has a university. The municipal library contains 76,500 volumes and 629 manuscripts. There are museums of art, archaeology, and natural history. Pop., 1901, 39,886; 1911, 41,242.

Poitiers was the capital of the Pictones or Pictavi, whence its modern name. The Romans called it Limonum. There are still a number of Gallic and Roman remains in the town and its vicinity. Christianity was introduced in the third century and about 353 St. Hilary became the first Bishop of Poitiers. In the fifth century the town fell into the hands of the Visigoths, whose King, Alaric II, was defeated by Clovis in battle near Poitiers in 507. In 732 Charles Martel checked the advance of the Saracens in the world-famous battle fought in the neighborhood. Near Poitiers, during the Hundred Years' War, the English, under Edward the Black Prince, gained a notable victory over the French under their King, John II, the Good, Sept. 19, 1356. The French, whose forces outnumbered the English more than five to one, opened the battle with a furious charge, but were thrown back by a volley from the English archers, and totally routed by the onset of the English men at arms. The slaughter of French knights was large. King John was taken prisoner. Consult Bélisaire Ledain, *Histoire sommaire de la ville de Poitiers* (Fontenay-la-Comte, 1892). See POITOU.

POITIERS, AGNES OF. See AGNES OF POITIERS.

POITOU, pwā'tō'. A former province of west France, now included within the departments of Vienne, Deux-Sèvres, and Vendée. The capital was Poitiers (q.v.). The ancient inhabitants of the region were the Pictavi or Pictones. It was overrun by the Franks in 507. Charles the Great placed Poitou under the jurisdiction of a count, whose descendants, at the beginning of the tenth century, assumed the title of dukes of Aquitaine. It came into the possession of the English kings through the marriage of Eleanor of Aquitaine with Henry II (q.v.), but was seized by the French King Philip Augustus in 1204. England held it again for about 10 years after the Peace of Breigny (1360), following the battle of Poitiers (1356). In 1416 it was permanently united with the French crown.

POISONOUS PLANTS



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- | | |
|-----------------------------------|--|
| 1 POKEWEED - PHYTOLACCA DECANDRA | 4 POISON IVY - RHUS TOXICODENDRON |
| 2 JIMSON WEED - DATURA STRAMONIUM | 5 POISON OAK - RHUS TOXICODENDRON |
| 3 POISON SUMAC - RHUS VENENATA | 6 BITTERSWEET, NIGHT SHADE - SOLANUM DULCAMARA |
| 7 WATER HEMLOCK - CICUTA MACULATA | |

POJOAQUE, pò-hwá'ká. See TANOAN STOCK.
POKANOKET, pò'ká-nòk'èt. A North American Indian tribe. See WAMPANOAG.

POKE (*Phytolacca decandra*). A perennial herb of the family Phytolaccaceæ, native of North America, but distributed also in northern Africa, the Azores, and the Hawaiian Islands



FLOWERING STEM AND FRUIT OF POKE.

and China and naturalized in southern Europe. It is often called garget, pigeon berry, and soko, and is found generally in good soil of waste places, as uncultivated fields, often attaining a height of more than 6 feet. See PHYTOLACCA, and Colored Plate of POISONOUS PLANTS.

POKER, or DRAW POKER. A game of cards said to be derived from primero or prime, a favorite English game of the sixteenth century. In France during the following century primero became ambigu, and a little later another variation, called brag, sprang up in the west of England, from which poker is more directly descended in its American form. The game may be played by from two to six persons. A full pack is used and five cards are dealt to each player, one at a time, after which, beginning at the dealer's left, each one may discard any or all of his cards, calling for as many new ones as he discards. This is the draw, and the player holding the most valuable hand is the winner. Beginning with the lowest, the values are as follows: a pair, two pairs, three of a kind (i.e., three cards of the same value), a straight, or five cards in regular order (in determining the value of straights the ace ranks either below the two or above the king, but stands at the end); a flush, i.e., where all five cards are of the same suit; a full house, full hand, or full, which consists of three of a kind and a pair together; four of a kind; a straight flush, in which the cards are in sequence and all of the same suit; and the royal flush, in which the cards of the same suit are the highest in the full pack.

Before the play is opened counters are divided in equal value among the players. These counters usually are disks—called "chips"—of cellu-

loid or some other composition, and of red, white, or blue color, to indicate their value. Before examining a hand each player deposits in the pool a value in counters previously agreed upon. This is the ante. After depositing the ante each player in succession after looking at his hand determines whether or not he will play. If he decides to play he is required to put up double the ante or as much more as he wishes up to the limit agreed on before the game begins. The player at his left has also the choice of staying out or depositing in the pool the same number of chips as the player who preceded him, in which case he is said to see him; or he may raise or go him better, in which case he deposits in the pool more than did his predecessor. The next or third player has also the choice of staying out or raising the preceding player, and so on with each in turn, one or more times around. Should all the players except one fall out, the one who remains takes the pool without showing his hand. Again, all the players in the game may see the one that raised last, in which case they are said to call the player's hand. Should none of the others have a better hand they let the one who has been called take the pool without displaying their own hands, otherwise the higher hands are tabled and the winner takes the pool. It is sometimes agreed that the players who desire cards in the beginning of the game must add to their antes, and sometimes players make bets before they make their draw.

The ante is large or small according as the eldest hand plays; the common method being to require each player to ante twice as much as the eldest hand, who will then have to make good at his next turn the rest of the ante or else fall out of the game. Bluffing is done when a player bets on a weak hand in the hope that the other players, thinking his hand justifies the bet, will stay out of the game and thus leave the pool to him. Aside from bluffing the only part of poker in which skill in the actual playing is requisite is in discarding. Some idea of the strength of a player's hand is got by taking note of the number of cards he calls for. There are many local variations in the value of hands and in the methods of betting.

POKOMOS, pò-kò'mòz. A Bantu nation of the Tana basin, British East Africa, long oppressed by the Galla and the Swaheli. They are of medium height and of light-brown color. Their huts are of beehive shape on raised platforms along the river banks. They are monogamists and are truthful. The Pokomos, in common with many other tribes of this region, are at a low stage of culture, having a loose type of social organization, a well-developed totemic system, and a firm belief in magic.

POKOMOS. A Central American Indian tribe. See MAYA.

POL, pól, VINCENTY (1807-72). A Polish poet, born at Lublin. Educated in a Jesuit college at Tarnopol, he thence went to Lemberg, where he came in touch with French romanticism. After traveling through Poland, in 1830 he became professor of German at Vilna, and in the same year, throwing in his lot with the liberators, wrote his first patriotic songs. Returning from exile in 1849, he was professor of geography at Cracow until 1853. He was forced to resign from this post, but returned to Cracow after several years in Lemberg. In his last years he was totally blind. Pol's most popular work was

Songs of our Land (1843), which deals with the various elements of the Polish population, but his best book is probably *Pictures from Life and Travel* (1847). His genius was essentially lyric and simple, at its best in descriptions of nature or of homely life. His collected works appeared at Lemberg (1875-78).

POLA, pólá. The chief naval station of Austria-Hungary, with one of the finest harbors in Europe, in the Crownland of Istria, on the Adriatic Sea, about 53 miles south of Trieste (Map: Austria, C 4). The bay, which is thoroughly sheltered, is spacious enough to accommodate a very large fleet. The town is strongly fortified by walls and a citadel overlooking the bay. The entrance to the bay is commanded by two forts and by various other fortifications on the islands in the bay and on its shores. Here are the dockyards, dry docks, and repair shops of the Austrian navy, the headquarters of the Admiralty, a hydrographic bureau, and various technical institutions. The town has several very imposing Roman remains, among which are the well-preserved temple of Augustus and Roma, the colossal Imperial amphitheatre, which could seat 25,000 persons, and the Porta Aurea, a sumptuous triumphal arch, dating from the beginning of the Christian era. The Marine Casino and the Monte Zaro, with the fine statue to Admiral Tegetthoff, form a delightful pleasure resort. Pola is an important commercial port. Pop., 1900, 45,052; 1910, 70,145. About 80 per cent are Italians, the rest being mainly Serbo-Croats and Germans.

Pola is of very ancient origin. It was destroyed by Julius Cæsar, but was rebuilt by Augustus at the request of his daughter Julia, from whom it obtained its name, Pietas Julia. It was a station of the naval fleet and bore the name of Republica Polensis. It was taken by the Venetians in the middle of the twelfth century and was destroyed in the struggle between Venice and Genoa. Its prosperity dates from about 1855. During the war which began in 1914 Pola was bombarded by the allied naval forces. See WAR IN EUROPE.

POLAC'CA. See POLONAISE.

POLAC'CO, GIORGIO (1875-). An Italian orchestral conductor, born at Venice. Having completed his musical studies at the conservatories of St. Petersburg, Venice, and Milan, he began his career as assistant conductor at Covent Garden. Then he directed for several seasons the Italian Opera at Rio de Janeiro and Buenos Aires. After his return to Italy he occupied the conductor's chair in the opera houses of Genoa, Florence, Rome, and especially Milan, where, besides the great Wagnerian works, all the French and Italian novelties were intrusted to him. In 1912 he was engaged as one of the conductors of the Metropolitan Opera House in New York. Here his opportunity came when in the spring of 1915 Toscanini, the principal conductor, was taken ill and Polacco directed the former's repertory for the rest of the season. Upon Toscanini's resignation Polacco succeeded him as principal conductor in the fall of the same year.

POLAK, pólák. See POLAND, *Ethnology*.

POLAND, pólánd. A former kingdom of Europe, whose territory was distributed (down to 1914) between Russia, Austria-Hungary, and Prussia. At its greatest extent, previous to 1660, it had an area of some 375,000 square miles, with a population of about 15,000,000,

and extended northward to the Baltic Sea and the Gulf of Riga, westward to Brandenburg, southward to Hungary, Moldavia, and nearly to the Crimea, and eastward so as to include most of the basin of the Dnieper. At the outbreak of the European War in 1914, about six-sevenths of this area was included in the Russian Empire, embracing Russian Poland (see POLAND, RUSSIAN), West Russia (Lithuania, Volhynia, etc.), a great part of Little Russia, Livonia, and Courland. The part of Poland which belonged to Austria constituted the Crownland of Galicia (q.v.). The parts of the Kingdom incorporated in Prussia included Posen (q.v.), West Prussia (q.v.), and the District of Ermland (q.v.) in East Prussia. Before its final partition in 1795 the area of Poland was reduced to 94,164 square miles, with a population of 4,500,000.

Ethnology. The territory comprised in the Kingdom of Poland before its dismemberment was inhabited by four ethnic types, Poles, Little Russians (Ruthenians), White Russians, and Lithuanians. The Poles proper have been identified with the Polianes, a branch of the Lekhs dwelling on the Vistula in the sixth century. The great Slav movement from the second to the sixth century A.D. had dispersed the tribes in all directions, towards the Baltic, beyond the Elbe, and into the Danube basin and the Balkan Peninsula. By the twelfth century the Germans had in a great measure pressed back the Western Slavs to the banks of the Vistula, and the development of Polish power was forced to the east and south among the Slav groups.

Ethnically the Poles belong to the Western Slav group. The bulk of them live in Russian Poland and adjoining parts of Russia, western Galicia, and the Prussian provinces of Posen and Silesia. They are below medium stature, their average height being 1.624 meters, and are mainly brachycephalic and blond. Deniker classes them in his fair, subbrachycephalic, short, or Eastern race, and sees among them traces of a secondary or Vistulian race, fair, mesocephalic, and of very short stature. Race fusion has energetically acted in this region among various sections of the Slavs, so that the Poles have the qualities coming from a good race mixture. Other Slavic tribes, as the Polaks or Podlachians in the Russian Government of Grodno, on the Polish frontier, and the Polesians of Western Russia have considerable Polish mixture. In Prussia, by the higher birth rate and by the absorption of German elements, the Poles have increased remarkably, notably in West Prussia and Silesia. The other fragments of the Polish Kingdom in Russia and Austria also show this tendency, though not with the same degree of progress as in Prussia.

History. Polish historians profess to go as far back as the fourth century, but the history of Poland previous to the middle of the tenth century is too legendary to have much value. About 840 a kingdom is said to have been organized out of kindred tribes under the Piast line of rulers, whose origin is uncertain. Ziemovit, said to be the second ruler of the Piast dynasty, is considered to be the first ruler whose history is to any extent to be relied upon; and it was not till a century after, when his descendant Miecyslaw (Miecislas or Mscislaw) I (962-992) occupied the throne and became a convert to Christianity, that Poland really came into the field of European history. Miecyslaw divided his dominions among his sons; but one of them,

Boleslaw (or Boleslas) I (992-1026), surnamed the Brave, soon reunited the separate portions, extended his Kingdom beyond the Oder, the Carpathians, and the Dniester, and carried on a successful war with the Emperor Henry II. About the same time the distinction between the nobles or warrior class and the agriculturists was distinctly drawn. This was of the utmost importance in the development of Poland, as it created a sharply defined caste, a military aristocracy, which became ultimately one of the most arrogant and oppressive in Europe. An important event was the foundation of the archiepiscopal see of Gnesen about 1000. Shortly before his death Boleslaw exchanged the title of Piast for King. He was succeeded by his son Mieczyslaw II (1026-34), during whose reign the Danes, the Hungarians, and the Russians made themselves masters of various territories which had been occupied by the Poles. Under Casimir I (1040-58) and his warlike son, Boleslaw II the Bold (1058-81), Poland regained something of its former power. The latter monarch having with his own hands murdered the Bishop of Cracow (1079), the country was laid under the papal interdict, and Boleslaw fled to Hungary, where he died. Boleslaw III (1102-39), an energetic monarch, conquered Pomerania, defeated the pagan Prussians, and defended Silesia against the Emperor Henry V. A division of the Kingdom among his sons was productive of much internal dissension. Silesia was severed from Poland, principalities ruled by branches of the Piast dynasty being established there. Ultimately Casimir II (1178-94) reunited the severed portions, with the exception of Silesia, and established on a firm footing the constitution of the country. A senate was formed from the bishops, palatines, and castellans, and the rights of the clergy and the peasantry were accurately defined.

Soon after Casimir's death Pomerania emancipated itself from Polish rule. In the thirteenth century the Teutonic Knights subdued the heathen Prussians and established their dominion on the shores of the Baltic, becoming formidable neighbors to the Poles. The Mongols swept over the Polish territories in 1240 and defeated the Poles, Silesians, and Teutonic Knights in the battle of Liegnitz (April 9, 1241). As a result of this invasion, Poland was divided into a number of independent principalities, and their dissensions led to the loss of large districts. During this period many parts of the country began to be colonized by Germans, who did much for Poland by establishing industries and developing municipal institutions. Large numbers of Jews, persecuted in western Europe, took refuge about this time in Poland. The country recovered under Ladislas (Wladislaw) I (1306-33), who abolished judicial abuses and illegally acquired privileges and assembled the first Diet for legislative purposes. He carried on successful campaigns against the Teutonic Knights, supported by the Grand Prince of Lithuania, and came to be known as the father of his country. Under him Cracow became the permanent capital of Poland. His son, Casimir III the Great (1333-70), increased the power and prosperity of Poland by cultivating the arts of peace, amending the laws, and consolidating his territories by profitable exchanges with the neighboring Powers. The Principality of Halicz (Galicia) was annexed to Poland. Extensive privileges were conferred on the Jews at a time

when the nations of western Europe were visiting on them the rigor of persecution. The foundations of the University of Cracow were laid. In the latter part of his reign Casimir fought successfully against the Tatars and Lithuanians. With Casimir the Piast dynasty became extinct. His nephew, Louis the Great, King of Hungary, succeeded him by the will of the deceased monarch and the election of the Diet; but during his reign Poland was treated merely as an appanage of Hungary. After the death of Louis of Hungary without male issue (1382) Jadwiga or Hedwig, daughter of Louis the Great, was chosen Queen of Poland (c.1384) by the Diet, and two years later she married Jagello (Jagellon), Grand Prince of Lithuania, who ascended the throne as Ladislas II (q.v.) and founded the Jagellon dynasty, which ruled over Poland and Lithuania from 1386 to 1572 and under which Poland was at the height of its greatness. Jagello at his accession embraced Christianity, which was now introduced into Lithuania, hitherto a heathen country. Jagello inflicted a great defeat upon the Teutonic Knights at Tannenberg in 1410. He was succeeded in Poland by his elder son, Ladislas III (1434-44), and in Lithuania by his younger son, Casimir. Ladislas, whom the Hungarians placed upon their throne, was overwhelmed by the Turks and slain in the battle of Varna. He was succeeded after an interregnum by his brother, Casimir IV (1447-92), during whose reign the Teutonic Knights, by the Treaty of Thorn (1466), ceded West Prussia to Poland and agreed to hold East Prussia as a Polish fief. Casimir rewarded the inferior nobles, or warrior class, with more extensive privileges, putting them on an equality of rank with the great chiefs of the realm and at the same time necessarily oppressing the peasantry. Manufactures and commerce revived to a remarkable extent in the Western provinces. The brief reigns of his two elder sons, John I (1492-1501) and Alexander (1501-06), were marked only by the increased power of the Diet, which was steadily absorbing the real authority and converting Poland from a monarchy to an oligarchy.

Sigismund I, surnamed the Great (1506-48), the youngest son of Casimir IV, raised the country to the utmost pitch of prosperity. Generous and enlightened, he was beloved by the masses, while his firmness and justice commanded the respect of the turbulent nobles. In a war with Russia, however, in the early part of his reign, he lost Smolensk. His son Sigismund II Augustus (1548-72) was a worthy successor to his father. During his reign the extraordinary privileges of the higher nobles were curtailed or abolished. Lithuania was finally joined indissolubly to Poland, the union being proclaimed by a Diet held at Lublin in 1549. There was but one Diet for the united realm, which was to be converted into an elective monarchy on the death of the reigning King, who had no heirs. Lithuania retained, however, her own army, treasury, and laws. Lithuania was at the same time reduced in area by the annexation of Podlachia, Volhynia, and the Ukraine to Poland. Livonia was ceded to Poland by the Knights Sword Bearers, and successful wars were waged against the Russians and the Turks. The Polish realm then stretched across central Europe from the Baltic Sea to the Dniester, with its western boundary less than 90 miles from Berlin and its eastern frontier about 150 miles from Moscow,

covering an area of more than 370,000 square miles. The population almost doubled under the two Sigismunds. The Reformation spread rapidly in Poland, but its progress was arrested by the Jesuits, who persuaded the nobles that their interests lay in the preservation of the Catholic hierarchy. With the death of Sigismund Augustus, in 1572, the Jagellon dynasty became extinct, and Poland passed under the régime of elected kings. The election was by the two chambers of the Diet—the Senate, or Chamber of the Chief Nobles, and the Chamber of Nuncios, or Representatives of the Inferior Nobles. The Diet sat only six weeks, and its decisions were required to be unanimous, so that, if the *liberum veto* (the right of forbidding the passing of any measure) were freely exercised even by a single member, all legislation was at a standstill. More unnatural still was the recognized right of any number of nobles to confederate for the purpose of effecting their will by force of arms.

This singular constitution produced the most inefficient government that was ever established in a great state. The first elective monarch was Henry of Valois, Duke of Anjou (1573–74), who had barely assumed the crown when he laid it down to become King of France as Henry III and was succeeded by Stephen Báthory (1575–86), Voivode of Transylvania. Stephen's successor, Sigismund III Vasa (1587–1632), was the son of John III of Sweden by a daughter of Sigismund I. His claims to the crown of Sweden, which he wore for a time, brought on wars with that Kingdom. Gustavus Adolphus carried on victorious campaigns against the Poles in 1621–29 and conquered Livonia. The imprudent attempts of the sovereigns of the house of Vasa to amend the constitution only excited the suspicion of the nobles and led to a further curtailment of royal authority. In 1648 the Cossacks, goaded by oppression, rose in rebellion under Bogdan Chmielnicki (q.v.), put themselves under the protection of Russia (1654), and ever afterward proved themselves the most inveterate enemies of the Poles. In 1655 Charles X of Sweden invaded Poland while the Poles were engaged in war with Russia, and in 1656 he was joined by Frederick William, the Great Elector of Brandenburg. The Poles were vanquished in a great battle at Warsaw in July, 1656. In 1657 Brandenburg went over to the side of Poland, which then renounced its suzerainty over the Duchy of Prussia (East Prussia). In the Peace of Oliva, in 1660, Poland formally ceded Livonia to Russia, and the Ukraine beyond the Dnieper was given up to Russia in the Treaty of Andrussovo in 1667. In 1674 the crown was conferred on John Sobieski, who shed lustre on the Polish arms by overthrowing, in conjunction with the German princes, a vast Turkish army in front of Vienna in 1683 and saving the Hapsburg capital. His reign, however, was productive of little good to the internal administration. He died in 1696, and the French Prince de Conti was elected and proclaimed King. Lacking efficient support from France, Conti renounced the office; and Frederick Augustus I of Saxony, surnamed the Strong, a protégé of the house of Austria, entered Poland at the head of a Saxon army and was chosen King as Augustus II (1697–1733). The Treaty of Karlowitz, in 1699, brought the last struggle between Poland and Turkey to a close and restored to Poland a large part of the

Ukraine. In 1700 Augustus entered into an alliance with Russia and Denmark for a joint attack upon Sweden, then under the rule of Charles XII. The war with Sweden was unpopular in Poland; in fact, the Poles of the Eastern provinces received Charles with open arms; but his attempt to force upon them Stanislas Leszczynski as their King deeply wounded their national pride. At Altranstädt in 1706 Augustus was compelled to abdicate, but after the defeat of Charles XII by Peter the Great at Poltava in 1709, he returned, supported by Russia and Saxony.

This beginning of Russian interference was a visible mark of the decline of Poland. Protestants were persecuted and excluded from public office. The election of Augustus III (1733–63) was accomplished by the most shameless bribery and under the compulsion of Russian troops and led to the War of the Polish Succession. (See SUCCESSION WARS.) His reign was of the same character as that of his predecessor. Towards its close the more enlightened of the Poles entered into a league to promote the establishment of a well-organized hereditary monarchy. But the conservative or republican party was equally strong and relied on Russian influence, which was used to continue the divisions in the country. Catharine II of Russia determined at the beginning of her reign to control Poland or take it, as it barred the way to the accomplishment of her great ambition, to bring Russia fully into the circle of the Western Powers. On the death of Augustus III she, acting in harmony with Frederick of Prussia, put forward as a candidate for the Polish throne Stanislas (Augustus) Poniatowski, an old lover of her own. This roused the national spirit of the Poles to intense opposition. The monarchic party, led by Prince Czartoryski, had succeeded in abolishing the *liberum veto* and in otherwise strengthening the government. Catharine, in alliance with Prussia, seized the pretext furnished by the oppression of religious dissidents of the Protestant and Greek communions by this dominant party and appeared as the champion of religious liberty. Russian troops entered the country and forced the election of Poniatowski (1764). Confederations were organized to resist Russia, and Turkey seized the occasion to attack that Power. To avoid the danger of a general war and to obtain compensation for the inevitable seizure of Polish territory by Russia, the governments of Prussia and Austria proposed a treaty of partition, which was concluded at St. Petersburg, Aug. 5, 1772. Russia acquired a part of the old Lithuania, comprising an area of 42,000 square miles, with a population of 1,800,000; Prussia took West Prussia without Danzig and Thorn, and the district on the Netze, 13,000 square miles, with 415,000 inhabitants; and Austria received Galicia and Lodomeria, 27,000 square miles, with 2,700,000 inhabitants.

Members of the Polish Diet were freely bribed to consent to the cessions. The old anarchical constitution with the *liberum veto* was restored. The country was now aroused to a sense of its danger, and the result was the adoption of the admirable constitution of 1791, which gave political rights to the cities, civil rights to the peasantry, and rendered the kingly authority hereditary. Frederick William of Prussia promised the Polish patriots support against Russia. Catharine II, however, by intrigues and bribery won a small number of the higher Polish no-

bility, who formed the Confederacy of Targovitz (May, 1792) and protested against the new constitution as derogatory to the ancient liberties. Catharine, thus armed with a pretext for interference, invaded Poland with an overwhelming army. The Poles fought bravely under Kosciuszko (q.v.) and won a victory over the Russians at Dubienka (July 17, 1792); but King Stanislas, after pledging his loyal support to the nation, gave his adhesion to the Confederacy of Targovitz. A Prussian army now entered Poland, and the country, its strength broken, was subjected to a second partition (July 17, 1793). Russia took a large part of Lithuania, half of Volhynia, Podolia, and the portion of the Ukraine which had remained with Poland—96,000 square miles, with about 3,000,000 inhabitants. Prussia appropriated the westernmost part of the Kingdom—22,000 square miles, with 1,100,000 inhabitants. A Diet convened at Grodno was compelled to sanction this "cession." A general rising of the Polish people to resist this dismemberment of their country took place in 1794. Kosciuszko was made Dictator and drove the Russians from Warsaw, but dissension among the Poles ruined their cause at the moment of seeming triumph. The Russians and Prussians reentered the country with increased numbers, and on Oct. 10, 1794, Kosciuszko was decisively defeated and taken prisoner at Maciejowice by the Russians. On November 8 Suvarov entered Warsaw, and Polish resistance came to an end. The third and last partition (Oct. 24, 1795) distributed the remainder of the country, Russia taking 45,000 square miles, with 1,200,000 inhabitants; Prussia, 21,000 square miles (including the capital, Warsaw), with 1,000,000 inhabitants; and Austria, 18,000 square miles, with 1,000,000 inhabitants. King Stanislas resigned his crown and died at Grodno as a pensioner of Russia in 1798. Napoleon, who promised the restoration of Poland and thereby gained the support of the patriots, was hailed with satisfaction, but all that Napoleon accomplished was the establishment, by the Treaty of Tilsit (1807), of the Duchy of Warsaw, formed out of the Polish territories taken by Prussia in 1793 and 1795. This state received a fairly liberal constitution, and King Frederick Augustus of Saxony as its nominal head, the real power being exercised by the French Emperor. The duchy was increased by western Galicia, ceded by Austria in the Treaty of Schönbrunn in 1809. The Poles furnished a considerable contingent to the French armies. The disaster to the French in Russia in 1812 and the advance of the allied army in 1813 put an end to the existence of the duchy. The partition of Poland was rearranged by the Congress of Vienna in 1815. Prussia retained West Prussia and recovered the western portion of the territory embraced in the Duchy of Warsaw, which region was constituted into the Grand Duchy of Posen; Austria recovered the territory which she had taken in the first partition of Poland in 1772 (Galicia), Russia was secured in the possession of all the territories that she had appropriated in the three partitions; out of the bulk of the Duchy of Warsaw was created a new Kingdom of Poland, which was to be united with the Russian Empire by a personal union. The city of Cracow, with a small surrounding territory, was erected into a republic, which was placed under the protection of the Great Powers. This final partition of Poland gave

Russia 220,500 square miles, Prussia 26,000 square miles, Austria 35,500 square miles. Of the portion which was to belong to the Emperor of Russia, about 49,000 square miles were included in the new Kingdom of Poland.

Alexander I of Russia first granted a liberal constitution, a separate standing army, and liberty of the press. Secret societies, as elsewhere in Europe, fomented a revolt, and a general insurrection of the people, headed by the aristocracy, took place. On Nov. 29, 1830, a military insurrection broke out at Warsaw, and in a short time the Russians were driven from the country. The leadership of the movement was assumed by a number of nobles, most prominent of whom was Prince Adam Czartoryski (q.v.). Chlopicki (q.v.) was appointed Dictator. In January, 1831, the independence of Poland was proclaimed, and Czartoryski was made head of the national government, Chlopicki having laid down his dictatorship. A Russian army under Diebitch invaded the country. The Poles fought with their wonted bravery and for months kept the enemy at bay, but their main army, under Skrzynecki, was defeated at Ostrolenka on May 26. Warsaw was taken by the Russians on September 8, and the Polish armies sought refuge on Prussian and Austrian soil.

There followed for those who had participated in the rebellion imprisonment, banishment, confiscation, and enforced service in the Russian army. From this time all self-government in Poland was suppressed. The liberal constitution of 1815 and laws were abrogated; strict censorship of the press and the Russian spy police system were established in all their vigor, the country was robbed of its rich literary collections and works of art; and the most severe and arbitrary measures were taken to Russianize the people. Large numbers of Poles were forced to take refuge in France and elsewhere, where they carried on an active revolutionary propaganda, and some of them played an important part in the struggle for liberty in other countries. (See BEM, DEMBINSKI.) The year 1846 witnessed another effort on the part of the Poles to shake off the yoke that had been imposed upon them. The movement did not proceed far. In Prussian Poland (Posen) it was promptly checked by the arrest of Mieroslawski (q.v.) and other leaders, while in Galicia the peasantry (in great part Ruthenians) rose against the nobles, the leaders in the outbreak, and massacred many of them. In the same year the Republic of Cracow was incorporated with Austria. In 1848 there was an insurrection in Posen, which was quickly suppressed. After the accession of Alexander II of Russia in 1855, the condition of the Poles was considerably ameliorated, and an act of amnesty brought back many of the expatriated Poles.

The Czar evinced by his acts his readiness to make far-reaching concessions to his Polish subjects, but in spite of this there were violent revolutionary demonstrations in 1861, which were repressed with bloodshed. In 1862 a régime of partial autonomy was inaugurated under the guidance of Marquis Wielopolski, a member of the Polish aristocracy; but the Russian government was not trusted by the Poles, and a revolutionary fever had taken hold of the youth, which found vent in fresh outbreaks and in attempts to assassinate the Viceroy Constantine (brother of the Czar) and Wielopolski himself. The Russian government proceeded to stern repressive measures, and in January, 1863, re-

sorted to a barbarous expedient in order to quell the revolutionary spirit—a wholesale conscription, suddenly executed, which should at one stroke remove the patriotic young men from the field of their activity. This measure, which could be but partially carried out, brought matters to a crisis, and the country rose in insurrection. This movement differed from the preceding uprisings in that it was largely a democratic agitation and was carried on under the guidance of a secret revolutionary committee. This body issued its first proclamation in February, 1863, and a week afterward Mieroslawski raised the standard of insurrection on the Posen frontier. The principal commander of the patriots was Langiewicz. It was little more than a mere guerrilla war, and no great or decisive conflicts took place. The sympathy of Europe was largely enlisted on behalf of the Poles, but the remonstrances of the Powers were wholly disregarded by the Czar's ministers. The Poles fought heroically against desperate odds. The national committee continued to guide the revolt and resorted to terrorism, even assassination, to carry out its measures and enforce obedience. The overwhelming numbers of the Russians soon carried everything before them, and early in 1864 the last sparks of the insurrection were stamped out. Large numbers of the patriots were executed, and many were transported to Siberia. Lithuania and other parts of old Poland, not included in the so-called Kingdom, were at once subjected to a process of Russification, which was carried out with extraordinary barbarity. By an Imperial ukase of Feb. 23, 1868, the government of Poland was completely incorporated with that of Russia.

After the insurrection of 1863 Russia began a systematic campaign for the Russification of Poland. By special laws passed in 1868 and 1869 Russian was made not only the official language of Poland, but the language of the high schools in which the Polish youth was to receive its education. In 1871 the Russian language began to be introduced into the elementary schools, and by 1885 Russian had become the language in which all subjects were taught in all schools. The Russian government did not stop there, but later forbade the use of the Polish language in advertising, etc. It also laid a heavy hand on the activities of the Catholic clergy and made special efforts to suppress the Uniate church. The effects of this policy were considerably aggravated in 1886 by an Act of the Council of State permitting the appointment of officials in Poland who were not qualified to hold office in Russia.

On the other hand, the Russian government made every effort to tie Poland to Russia economically. As far back as 1822 a special tariff was arranged between Poland and the Russian Empire which made trade between the two countries almost free. As Russian Poland had also been guaranteed free commercial relations with the Austrian and Prussian parts of the ancient Polish Kingdom, it now became the great trade route between Western Europe and Russia. In 1850 Poland was included in the general customs boundary of the Empire, and the great system of railroads connecting Poland with St. Petersburg, Moscow, and the south of Russia was begun soon afterward. Special attention was devoted to the industrial development of the region, which soon became important as a great centre of the textile, steel, and other industries

Under the influence of economic considerations a new tendency in favor of reconciliation with Russia began to make headway in Polish life. In 1896 this tendency found expression in the formation of the *Narodowa Demokracja* (people's democracy), a political party which gave up the idea of the restitution of Poland and demanded merely national autonomy under the sceptre of the Czar. The same party soon spread its activities to Austrian and Prussian Poland, proclaiming everywhere the same platform—national self-government under the laws of the respective countries. This party was particularly strong among the aristocratic and capitalistic elements of the Polish population. The lower middle class and the industrial workers continued to strive for an independent Poland. The party with an extreme Nationalist programme was the Socialist Proletariat party (S. P. P.), which began its activities in 1882.

The Russo-Japanese War and the revolutionary movement of 1905-06 greatly aroused the hopes of the Polish nation. The elections to the First and Second Duma returned many Polish representatives, who immediately brought up the question of Polish autonomy. The Third Duma, elected on the basis of the reactionary law, was less favorably disposed to the demands of the Polish representatives. The Fourth Duma, however, passed a bill granting some of the elementary rights to the Poles, but it was voted down by the Council of State (the senate of Russia). When the European War broke out the commander in chief of the Russian army, Grand Duke Nicholas, published a manifesto to the Poles which proclaimed that the hour had struck for the realization of Polish hopes and called upon the Poles of all countries to unite under the sceptre of the Czar. The manifesto contained the promise that under this sceptre Poland would begin its regeneration "free in religion, language, and self-government."

The first realization of this promise so far was the law on municipal self-government passed March 17, 1915, to become effective Jan. 1, 1916. The law introduced high property qualifications for voters and subjected the local authorities to administrative interference on the part of appointed officials. Its only satisfactory clause was that which permitted the conduct of the official business in Polish. As a whole the law came as a disappointment to the Polish people and even to the Russian liberals who demanded the entire reorganization of municipal government on far more liberal lines.

The defeat of the Russian armies (see WAR IN EUROPE) in the summer of 1915 induced the Russian government to make another concession. On June 25, 1915, a special council of 12 (six Russian officials and six representatives from Poland) was appointed to consider the question of carrying out the promise of autonomy contained in the Manifesto of Aug. 14, 1914. The desire to conciliate the Polish people grew in view of the new situation created by the war. The political parties of Poland took advantage of every change in the situation to advance their national cause. A national committee was organized to press the claims of the Polish people. The differences between the principal programmes had not disappeared, however, but the tide in favor of national independence seemed to be growing. The idea of union with Russia met with the strongest opposition in Galicia, where the Poles have been enjoying national rights

and local self-government since 1867. The Austrian Poles fought valiantly for Austria and formed special Polish legions of Poles of all countries to fight against Russia. For Austrian Poland, see AUSTRIA-HUNGARY; GALICIA.

In Prussian Poland the struggle between Pole and German has been very active and has been fought out on an economic basis. It was Bismarck's policy to plant a Germanic population on Polish soil, and to this end vast sums were spent in buying up Polish estates, which were then peopled with German colonists. In spite of the strenuous efforts of the government, however, the Poles have more than held their own. The national spirit has undergone a great revival and has united the nobility and the masses in opposition to the domination of the Prussians. The policy of Prussification has been pursued by the government through the introduction of the German language in the schools, a measure which led to bitter dissatisfaction among the Poles and some slight disturbances in 1901. The pressure of Germanization was responsible to a considerable degree for the idea of reconciliation with Russia described above. It was the direct stimulus to the revival of the old idea of a Slavic Union against the Germans. The Poles and the Czechs called the Neo-Slavic Congress of Prague in 1908, at which an attempt was made to reconcile all Slavic nations and to lay the basis for a common Slavic policy. The attempt was not successful. The War which began in 1914 upset all previous calculations. The Poles were divided into camps fighting each other against their will. The war will probably leave its most devastating effect on Russian Poland, which was ruined by fire and sword. Galicia also suffered greatly. The great Polish problem in the near future will therefore be not only national restitution, but economic reconstruction. See POSEN, PRUSSIA.

Bibliography. Sources: *Scriptores Rerum Polonicarum* (Cracow, 1872 et seq.), *Acta Historica Res Gestas Poloniae Illustrantia* (ib., 1878 et seq.), both published by the University of Cracow. *Codex Diplomaticus Majoris Poloniae Documenta*, edited by the Literary Society of Posen (3 vols., Posen, 1877-79). Of works in English, S. A. Dunham, *The History of Poland* (London, 1831), is compact and useful, especially in its earlier portions, James Fletcher, *The History of Poland from the Earliest Period to the Present Time* (New York, 1840), is an interesting work, but less reliable than the preceding. Consult also: Kalixte de Wolski, *Poland* (London, 1883); H. K. B. Moltke, "Poland," in *Essays, Speeches, and Memoirs*, vol. 1 (New York, 1885), translated from the German, a valuable sketch; W. R. Morfill, *The Story of Poland* (ib., 1893), in the "Story of the Nations Series." Joachim Lelewel, *Histoire de Pologne* (2 vols., Paris, 1844), is a Polish plea, but standard. N. A. de Salvandy, *Histoire du roi Jean Sobieski et du royaume de Pologne* (5th ed., 2 vols., ib., 1855), is standard for Polish history up to the reign of John Sobieski, Ropell and Caro, *Geschichte Polens* (Hamburg, 1840-63), is the fullest and best of general histories of Poland. On special periods there are Richard Röpell, *Polen um die Mitte des 18. Jahrhunderts* (Gotha, 1876), an able treatise on the period 1697-1763; Brüggén, *Polens Auflösung; kulturgeschichtliche Skizzen aus den letzten Jahrhunderten der polnischen Selbstständigkeit* (Leipzig, 1878); Joachim Lelewel, *Poland in the*

Middle Ages (4 vols., Posen, 1846-51); Emil Reich, "Hungary and the Slavonic Kingdoms," in *Cambridge Modern History*, vol. i (New York, 1902), containing a bibliography; R. N. Bain, *Slavonic Europe: Political History of Poland and Russia, 1447-1796* (ib., 1908). On the revolutionary movements in Poland: C. C. de Rulhière, *Révolutions de Pologne* (Paris, 1862). H. Kunz, *Der polnisch-russische Krieg von 1831* (Berlin, 1890); K. Kozmian, *Das Jahr 1863* (Vienna, 1896); Szymon Askenazy, "Poland and the Polish Revolution," in *Cambridge Modern History*, vol. x (New York, 1907), containing a bibliography. On the partitions: A. de Ferrand, *Histoire des trois démembrements de la Pologne* (3 vols., Paris, 1864); A. Beer, *Die erste Teilung Polens* (2 vols., Vienna, 1873); Albert Sorel, *The Eastern Question in the Eighteenth Century, the Partition of Poland, and the Treaty of Kainardji* (Eng. trans. by F. C. Bramwell, London, 1898); Richard Lodge, "The Extinction of Poland," in *Cambridge Modern History*, vol. viii (New York, 1904), containing a bibliography; Lord Eversley, *The Partitions of Poland* (London, 1915). Also: G. M. C. Brandes, *Poland: A Study of the Land, People, and Literature* (New York, 1903); F. L. Petre, *Napoleon's Campaign in Poland, 1806-07* (new ed., London, 1907); Richard Lodge, "Austria, Poland, and Turkey," in *Cambridge Modern History*, vol. v (New York, 1908), containing a bibliography. R. N. Bain, *The Last King of Poland and his Contemporaries* (ib., 1909). M. A. Leblonde, *La Pologne vivante* (3d ed., Paris, 1911); N. O. Winter, *Poland of To-Day and Yesterday* (Boston, 1913); Ninian Hill, *Poland and the Polish Question* (New York, 1915); F. D. Little, *Sketches in Poland* (ib., 1915).

POLAND, RUSSIAN. An historical division, forming the westernmost part of the Russian Empire (Map: Russia, B 4). Russian Poland is known officially as the Privislanskiya Gubernii or Governments on the Vistula, and at the outbreak of the European War in 1914 it consisted of nine governments, Kalisz, Kielce, Lomza, Lublin, Piotrkow, Plock, Radom, Suwalki, and Warsaw, with a total area of 49,159 square miles, with 4,764,774 acres under forests. The greater part of the country is a plain, rising in the south into spurs and foothills of the Carpathian Mountains. The chief river is the Vistula, which passes from south to northwest through the centre of the country and with its branches waters the greater part of it, though the western part is drained by the German river Warta. The soil is fertile, and one-half of the area of the country is arable land. The principal crops are potatoes, rye, oats, and wheat. The raising of live stock, especially sheep and horses, is also important. Mining is carried on to a considerable extent in the southern highlands, and large quantities of coal and iron ore are produced. The total value of manufactured products was estimated at \$430,000,000 in 1912. Commerce is greatly facilitated by navigable rivers and over 2000 miles of railroad. The exports pass chiefly by way of Danzig and consist principally of wheat, timber, wool, and cattle products. The total population in 1913 was 11,960,500, consisting chiefly of Poles, with about 1,000,000 Russians, over 1,500,000 Jews, and a number of Germans. Russian is the official language and the language prescribed in the public schools. The Roman Catholic church

is adhered to by four-fifths of the inhabitants and is officially administered by the Ministry of the Interior at St. Petersburg. For further details, see articles on the separate governments; and for history, see **POLAND** and **WAR IN EUROPE**.

POLAND-CHINA. A breed of hogs. See **HOG**, and **Plate of HOGS**.

POLANGUI, pò-lán'gè. A town of south Luzon, Philippines, in the Province of Albay (Map: Philippine Islands, D 4). It lies 20 miles northwest of Albay, on the main road of the province, and on the Inaya River, in a situation favorable for hemp traffic. Pop., 1903, 7960.

POLAR. See **POLE** and **POLAR**.

POLAR BEAR. The white or ice bear of boreal regions. See **BEAR**; **HUNTING BIG GAME**.

POLAR CIRCLE, or **ARCTIC CIRCLE**. See **ARCTIC**.

POLAR CLOCK (from Neo-Lat. *polaris*, relating to the pole, from Lat. *polus*, from Gk. *πόλος*, *polos*, pivot, axis, pole, from *πέλεσθαι*, *pelesthai*, to be in motion, connected with *Skt. car*, to move). A form of polariscopic clock invented by Sir Charles Wheatstone, based on the fact that light from the sun when scattered by the fine particles of the atmosphere becomes polarized. (See **POLARIZATION OF SKY LIGHT**.) It consists of a hollow conical tube so mounted that its axis can be brought parallel to the axis of the earth. This conical tube itself can be rotated and contains at its larger end, adjacent to a glass disk graduated to show the hours of daylight, a second glass disk, on which at the centre are cemented a star-shaped series of thin scales of selenite, which, when viewed by polarized light, exhibit strong contrasts of color. At the smaller end of the tube is mounted the Nicol prism with either of its diagonals making an angle of 45° with the principal section of the selenite plates. When seen through the Nicol prism the selenite will show a variety of rich colors, depending upon the position of the prism, but there will be two positions where the color will entirely disappear. Time is ascertained by turning the tube on its axis until the color of the star entirely disappears, while the central disk remains red; the index should then point to the hour. Unlike the sundial, the polar clock need not be placed in the sun's rays; it may stand in the shade of a tree or building or at a window, and it may be used when the sky is overcast, unless the obscurity is too great. Consult: Spottiswoode, *Polarization of Light* (London, 1895); Hopkins, *Experimental Science* (New York, 1898).

POLAR COORDINATES. See **COORDINATES**.

POLAR EXPLORATION. See **POLAR RESEARCH**.

POLAR HARE, or **ARCTIC HARE**. The American variety (*arcticus*) of the European northern hare (*Lepus timidus*). See **HARE**.

POLARIS. See **POLESTAR**.

POLARISCOPE (from Neo-Lat. *polaris*, relating to the pole + Gk. *σκοπεῖν*, *skopein*, to view). An instrument which consists of any combination of a means of producing polarized light, or polarizer, and a device for testing the polarization of light, or analyzer. In ordinary light (see **LIGHT**) the direction of vibration is changing millions of times a second. As a result of reflection (or refraction), the direction may be made to remain constant, and the light is then said to be polarized plane, elliptically, or circularly, according as the motion of the ether particle is linear, elliptical, or circular.

When light is reflected from the surface of a transparent medium, as glass, at the polarizing angle, the tangent of which is equal to the index of refraction of the medium, it is found to be plane polarized, and the plane in which the



FIG. 1. TOURMALINE TONGS.

This apparatus consists of two plates of tourmaline so mounted as to revolve in their holders. The crystal or thin plate to be examined is placed between the two plates of tourmaline; the two plates act as polarizer and analyzer respectively.

incident and reflected rays lie is called the plane of polarization. If such a polarized beam of light is allowed to fall upon a second similar mirror at the polarizing angle, it will enter the medium or be reflected according as the plane of this reflection is parallel or perpendicular to that of the first reflection. Polarization by reflection was discovered by Malus in 1810. As early as 1690 Huygens discovered that the two rays of light produced by the double refraction in calcite were polarized at right angles to each other.

Three methods of obtaining a beam of plane-polarized light for experimental purposes are in

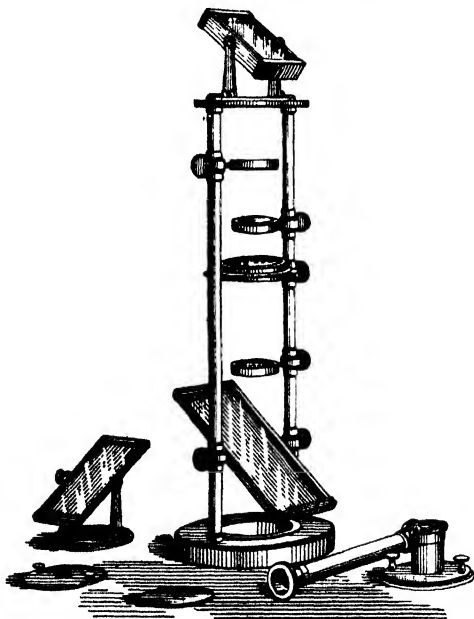


FIG. 2. NORREMBERG POLARISCOPE

The polarizing mirror is shown in place, while above, attached to the uprights, are lenses for producing parallel, divergent, or convergent beams of light, and a support on which thin plates or other objects to be studied may be placed. The bundle of thin plates at the top used as an analyzer may be replaced by a Nicol prism, shown to the right at the base of the instrument, or by a mirror at the polarizing angle, shown to the left.

general use and are employed in polariscopes: (1) reflection at the polarizing angle; (2) double refraction and the elimination of one of the beams, (a) by reflection (Nicol prism), (b) by sending it off to one side (Rochon prism, etc.),

and (3) double refraction and the absorption of one-beam tourmaline plates. The Nicol prism (q.v.) is most generally employed in polari-

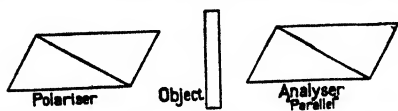


FIG. 3. POLARISCOPE WITH POLARIZING PRISMS PARALLEL.

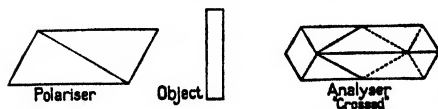


FIG. 4. POLARISCOPE WITH POLARIZING PRISMS CROSSED.

scopes and forms one of the best means for the production and detection of polarized light.

In a polariscope the polarizer and analyzer may be similar or not. In the form devised by Norremberg (Fig. 2) the polarizer is the mirror at the bottom of the apparatus, and the analyzer is a Nicol prism in the eyepiece at the top, or it may be that a bundle of thin plates of glass are used, as shown in the figure. When the plane of polarization of both polarizer and analyzer is the same, the ray which emerges from the polarizer will pass on through the analyzer, and they are said to be parallel (Fig. 3), but if the two planes are perpendicular, then the beam will all enter as the ordinary in the analyzer and be reflected and lost, and they are said to be crossed (Fig. 4); the eye looking

in at the eyepiece sees a dark field. If a plate of transparent material be introduced between the polarizer and analyzer, it may happen that the field of the crossed combination will become light or colored. This will mean that the material has in some way affected the ray emerging from the polarizer so that it is no longer entirely cut off by the analyzer. Such substances are in general said to be double-refracting. Substances that do not so affect the polarized beam are called isotropic or single-refracting. The double refracting substances are generally crystalline and fall into two broad classes, uniaxial and biaxial. In certain double-refracting crystals there is one direction in which all light travels with the same velocity, and hence no double refraction occurs. This direction is called the optic axis, and such substances are uniaxial. In biaxial crystals there are two directions, or optic axes, along which all light travels with the same velocity and around which the optical properties group themselves.

Substances are studied in the polariscope in either parallel or convergent (or divergent) light, and the double-refracting media in general produce two beams from the original beam coming from the polarizer, and these two new beams, traveling with different velocities, are made to interfere when their components are brought into the plane of the analyzer. As white light is generally employed at the polarizer, and as the kind of interference is a function of the wave length, colors are usually seen at the analyzer. A complete study of these color phenomena, and their general behavior in the polariscope, make it possible to determine the identity of most minerals from their optical properties. This branch of optics has developed into microscopic petrography, which has so supplemented the other tools of the mineralogist and geologist that these sciences have been revolutionized.

Certain substances, as quartz parallel to the optic axis, solutions of sugar, tartaric acid, etc., possess the peculiar property of rotating the plane of polarization to an extent depending upon the wave length of the light and the thickness of the layer traversed. That is to say, if the polariscope is set crossed and a plate of quartz cut perpendicular to the axis introduced, the eyepiece field will appear lighter if monochromatic light is used, and it will be necessary to rotate the analyzer in order to obtain the dark field again. This rotation may be clockwise as viewed from the polarizer, right rotating or dextrorotatory, or it may be the reverse, left rotating or levorotatory. If white light is used colors will appear in the field of view, and the

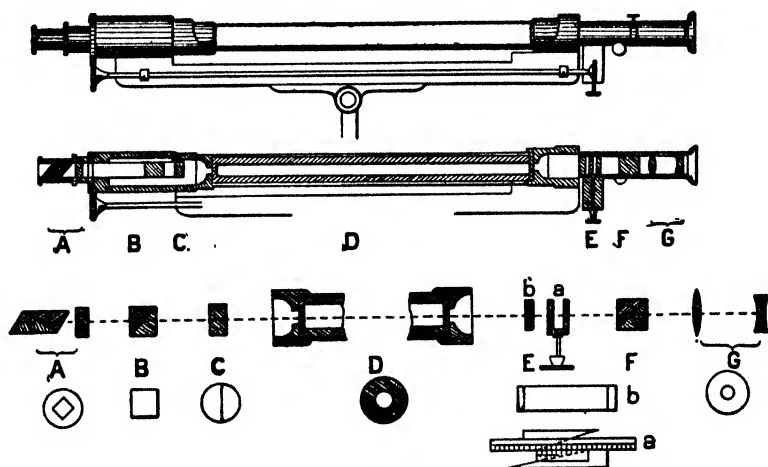


FIG. 5. SOLEIL POLARISCOPE FOR LIQUIDS.

D is the tube in which the sugar solution is placed; C is a double quartz plate, half right and half left, rotating, which affords a very sensitive means of setting the instrument to the same adjustment each time; B is the polarizer. A is a combination of a Nicol prism and a quartz plate, which by rotation enables the observer to correct for the color of the solution and obtain the most sensitive tint in the double quartz plate C; F is the analyzer; G is a small Galilean telescope focused upon C, and E is the compensating system which corrects the rotation due to the solution instead of following it up. A plate of right quartz, b, is just neutralized by wedges of left quartz, a, when they are as shown at a.

tint crossed will always be complementary to that seen in the parallel position. These colors are in general due to the fact that, as the rotation for different colors is different, certain ones will be passed through the analyzer and others cut off.

The rotation of the plane of polarization in solutions of cane sugar is made use of commercially on a very large scale in testing and de-

termining customs duty on raw sugar for its content of crystallizable sugar. Very many forms of apparatus have been devised for this especial purpose. One of the more complicated, due to Soleil, is shown in Fig. 5, where the amount of rotation is neutralized by quartz wedges. If the solution rotates right, then the wedges are slid together so as to offer an excess of left rotation and neutralize the right rotation of the solution. If the solution is left rotating, the wedges are slid apart and the excess of right rotation neutralizes the rotation of the solution. The motion of the wedges is controlled by a rack and pinion and is measured by a scale which may be made to read off percentage of sugar directly, provided a solution of certain standard strength and length is used. In its most modern form this instrument was known in France as the *Soleil-Dubosq* and in Germany as the *Soleil-Ventzke-Schiebler*, but transition-tent instruments have been in large part supplanted by the half-shade polariscopes, of which there are a number of types of considerable accuracy, where equality of shade in the field is looked for.

In such a system the light from the polarizing prism is plane polarized in two planes, which make an angle to each other known as the polarizing angle, and upon the magnitude of this angle depends the accuracy with which settings can be made. The polarizing systems used in the best-known modern instruments are usually the Laurent, Jellet or Lippich type, the last named being a standard form of quartz compensating polariscope, employing as it does a white-light source and the quartz wedges arranged for direct reading. A polariscope of the Lippich principle arranged so that the position between the two polarizing prisms can be varied has been devised by F. Bates at the United States Bureau of Standards and has given an accuracy of $\pm 0.01^\circ$ S. for the polarizing of the better grades of sugar. See ELECTRICITY; LIGHT; SUGAR.

Bibliography. Mascart, *Traité d'optique* (Paris, 1889); Spottiswoode, *Polarization of Light* (London, 1895); Thomas Preston, *The Theory of Light* (3d ed., New York, 1901); H. H. Landolt, *The Optical Rotating Power of Organic Substances and its Practical Applications* (Eng. trans., 2d ed., Easton, Pa., 1902); J. W. Rolfe, *Polariscope in the Chemical Laboratory* (New York, 1905), containing a bibliography; S. P. Thompson, *Light, Visible and Invisible* (2d ed., ib., 1910); Sir T. E. Thorpe, "Sugar," in *Dictionary of Chemical Technology* (London, 1913); also publications of the United States Bureau of Standards (Washington).

POLARITY, IN PLANTS. All plants, from filamentous forms having differentiation into base and tip up to the highest plants, show polarity of structure and function. This can be best presented by a few illustrations. If the cells of a filamentous green alga like *Cladophora* are separated, each cell will form a rhizoid at its base and a new green cell at its tip. If a portion of a willow sprout bearing several nodes is placed in a moist chamber, the most vigorous roots will develop from the morphologically basal nodes, and the most vigorous will sprout from the apical bud. If a scarlet runner plant having several internodes is deprived of its terminal bud, the bud in the axil of the first leaf below will begin growth and function as the terminal bud. If in turn this bud is removed, the one immediately below it will develop

and assume the function of a terminal bud, and so on down the plant. Any bud that happens to be functioning as a terminal bud inhibits the growth of all buds below it. The shortest possible slice of the thallus of a liverwort, provided it is one or more cells thick, may regenerate a new thallus. The apical face of the slice always produces the apical portion of the thallus, and the basal face the basal portion. From these illustrations it appears that every portion of a plant, even down to the individual cell, is differentiated into a basal and apical end, i.e., it is a polarized structure.

Polarity is generally already determined in the egg and cannot be reversed by modification of such external conditions as light and gravity. There are a few cases, however, where polarity is determined or even reversed by external conditions. Varying intensity of illumination on different sides of the spores of *Equisetum* and the eggs of *Fucaceæ* determines their polarity. The polarity in *Basidiobolus ranarum* may be reversed by unilateral chemical stimulation, and the same may be accomplished by unequal illumination of different regions of *Bryopsis* and many other algæ. A study of polarity in plants almost always implies regeneration or reparation and correlation (q.v.). See PHYSIOLOGY OF PLANTS.

POLARIZATION. A term used in physics with many applications, but usually to signify a property of matter or of the ether that has a definite direction. A magnet is said to be polarized; so is a dielectric under the action of electrically charged bodies. When, owing to the passage of an electric current through an electrolyte, there are chemical actions at the electrodes that oppose the current, the electrolytic cell is said to be polarized. When a definite characteristic is given ether waves—e.g., if the vibrations are all in one plane or if they are all in circles or ellipses—they are called polarized. See ELECTRICITY; LIGHT; POLARISCOPE; VOLTAIC CELL OR BATTERY.

POLARIZATION OF SKY LIGHT. The polarization of blue sky light was known to Huygens and is evident to any one who will look at the sky through a prism of Iceland spar. After a systematic investigation of the distribution of polarized light in different parts of the sky, Arago (1811) discovered that a certain portion or spot in the sky shows no polarization. This point varies with the altitude of the sun. Subsequently similar points were discovered by Arago (1840) and Brewster (1842). The maximum polarization occurs in a narrow zone 90 degrees distant from the sun. Similar but feeble polarization occurs in moonlit skies. There is no polarization in fog, cloud, or dense haze. As there is an evident connection between the polarization of sky light and the quantity of moisture, haze, or smoke in the atmosphere, there have been numerous investigations of this subject both from an observational and a theoretical point of view.

The simplest and most accurate polarimeter for studying this phenomenon was devised in 1872 by Prof. E. C. Pickering, director of the Harvard College Observatory. Observations made with this apparatus seem to show that the reflection of the sunlight from the surface of the sea into the atmosphere produced a decidedly perceptible disturbance of the polarization of sky light as compared with that observed from interior stations where such reflection from

water surfaces was impossible. Observations of sky light during total eclipses of the sun seem to have shown that the amount of polarized light increases during and just before and after totality. Such an effect might be produced either by the increased condensation of aqueous vapor, owing to the cooling of the atmosphere within the shadow of the moon, or by the fact that in place of the ordinary sunlight we now have to do with the polarized light from the solar corona.

The most acceptable theory as to the origin of the polarization is that started by the experiments of Tyndall on the reflection of sunlight from delicate clouds of vapor and perfected by Lord Rayleigh, who showed that when light is transmitted through a cloud of particles smaller than the wave length of the light, the latter is scattered laterally and polarized in the plane of scattering. In 1899 Rayleigh submitted the additional demonstration that not merely the grosser particles of dust and aqueous vapor, but even the molecules of oxygen and nitrogen, and probably those of other gases, take part in the process of scattering and polarization. Consult *United States Monthly Weather Review* (Washington, 1900) and H. H. Kimball, *Solar Radiation, Atmospheric Absorption, and Sky Polarization* (ib., 1910).

POLAR LIGHT. See TERRESTRIAL ELECTRICITY.

POLAR RESEARCH. The polar regions comprise all lands and seas within the polar circles, extending northward from the Arctic circle and southward from the Antarctic circle. The exploration of the polar regions has been slow and hazardous owing to adverse physical conditions. To the south the ice-covered continent of Antarctica is swept by violent and prolonged blizzards, while its coasts are difficult of access, being fringed by oceanic ice caps and projecting glaciers. To the north the vast Arctic Ocean is always ice-covered, except along the coasts of bordering southerly lands, by ever-moving fields of such compactness, extent, and thickness as to be unnavigable for ships and hazardous for sledge travel even during the colder seasons of the year.

Motives of Polar Research. Exploration in the Far North has been more frequent and extensive than in the Far South, chiefly because the Arctic zone is much nearer to the great maritime nations than are the Antarctic regions, and its waters are convenient of access from the main trade routes of modern times. The whale and seal fisheries were intimately related with the initiation and continuation of the great era of Arctic discovery in the seventeenth century. After Henry Hudson (1607) followed the winding fringes of the impenetrable ice fields from Nova Zembla to Greenland, for 150 years nearly all information of the Arctic regions was drawn from the log books of the Dutch and the English whalers. The commercial interests which first dictated great Arctic voyages had two distinct objectives. One was the endeavor to extend the area of the Northern fisheries; and while the prosecution of the Arctic whaling industries added a vast sum to the wealth of the world—estimated at more than \$600,000,000 in 200 years before the middle of the nineteenth century—it naturally resulted in large accretions to existing knowledge of the north-polar world. A more important object was the discovery of a navigable sea route between the ports of north-western Europe and of the Indies. Debarred or

restricted in their commerce around the Cape of Good Hope, the discovery of either a northeast or a northwest passage (qq.v.) would enable Northern nations to participate largely in the profitable trade of the Orient. This ambition was a great stimulus to Dutch and English explorations from the days of Barents, Baffin, and Hudson until the decadence of Spanish power.

These and other commercial incentives for polar exploration lasted until the beginning of the nineteenth century, and since they were fostered among the seafaring nations of the Northern Hemisphere, the natural result is that, while the unknown area of the Arctic regions is now not larger than European Russia, that of the Antarctic domain is double the area of Europe. As commercial interest waned, the thirst for extension of national interests led to systematic researches for new lands and new people, which incidentally—as in the voyages of Cook, Vancouver, Kotzebue, and others—added to the world's knowledge of the polar zones. The era of scientific research scarcely flourished before the middle of the nineteenth century. The humanitarian impulse that caused the dispatch of many expeditions to rescue Sir John Franklin resulted in enormous additions to a knowledge of the northern coasts of Arctic America. The renewal of Antarctic exploration at the beginning of the twentieth century, after an intermission of nearly 50 years, was owing largely to a spirit of scientific research, but in part for the purpose of geographic achievement—that of reaching the South Pole. In the past few years the work has again assumed commercial aspects, as indicated by the occupation and exploitation by France of the Kerguelen Islands and more especially through the annexation (1908) by Great Britain of Graham (or Palmer) Land, doubtless in view of the very lucrative whale and other fisheries, of which the South Shetlands group is the main base. Military reasons account in one case for the discovery of new land in the Arctic. About five years ago the Russian government commissioned two ice breakers to proceed from the Far East westward to the European coast in order to settle the vexed question raised by the war with Japan regarding the practicability of the northern passage for war-ships. The discovery of Nicholas II Land was the outcome of this expedition.

Equipment. The marked advance in the last decade of polar research has been in large part owing to improvements in methods of life and in outfits for work within the ice zones, based on the polar experiences of three centuries and perfected through the utilizations of modern inventions and of scientific knowledge. The problem of a fairly comfortable and hygienic existence for explorers in the polar regions has been solved. The food supplies long consisted of salted meats, and until recently the dietary of whalers and of explorers was such as was often followed by scurvy, which for three centuries has been peculiarly an Arctic disease. To-day it may be said that the selection and preservation of healthful foods of ample nutritive value for the use of polar explorers have been reduced to a scientific basis. The appearance of scurvy among members of an expedition to-day is the result of neglect or of ignorance. The ships formerly used by explorers were, as a rule, unsuited to ice navigation. In recent years vessels have been built specially with reference to use in ice, and the *Discovery*, *Fram*, *Gauss*, *Roosevelt*,

and *Taimyr* have proved to be ideal types for the various kinds of ice to be navigated. In addition to sail and steam power they have electric power, sanitary quarters, detachable rudders, and explosives suitable for use in freeing the ship when beset or for blasting open a way through short spaces of heavy ice. The introduction of electricity at the main shore stations not only tends to prevent mental depression caused by polar darkness, but also provides power for many purposes, furnishing heat for cooking and other uses. Wireless telegraphy also aids, serving to keep distant stations in touch with the outside world and to render possible calls for assistance. Portable huts, after the pattern of the Lady Franklin Bay Expedition (1881-84), assure at home stations facilities, unknown to earlier explorers, for comfort, for domestic duties and scientific work. Clothing and foot gear are adapted to conditions of travel and of weather, of which the general characteristics are known, thus reducing to a minimum the physical suffering, frost bites, etc. incidental to field work. For draft purposes in general the use of men has been conclusively proved to be inferior to the employment of dogs, or ponies, which animals are in turn gradually being replaced by power vehicles in the form of motor sleds and aeroplanes. Tentage, cooking apparatus, and sledging outfits have been improved in type, thus adding to efficiency by increased comfort and reduced labor. Under many conditions the introduction of the Norwegian ski has proved to be advantageous. While some of the methods of the Eskimo and other Arctic aborigines have been followed to advantage, the use of such people as allies is recognized as convenient at times, but as absolutely unessential to success. The journeys of Koch, Mylius-Erichsen, Shackleton, Scott, and Amundsen, exceeding in length others made elsewhere, prove the superiority of their personnel for sledging work under the most arduous and unfavorable conditions.

Finally, it may be said that increased knowledge of ice navigation in its various phases, selected lines of operation, wise provision for retreat, have very materially increased the percentages of success and reduced the number of fatalities. Polar exploration is no longer associated with undue loss of life, since its proportionate fatalities are fewer than those of tropical explorations. It has been authoritatively stated, e.g., that the loss of life in polar explorations since 1900 is but a tenth of that resulting from alpine climbing.

NORTH-POLAR EXPLORATIONS

Fully one-half of the area of the Arctic regions consists of well-known land, of which, however, only that of Norway, Sweden, and considerable portions of Siberia and Alaska are inhabited. Scattered Eskimo huts dot the sea-coasts of the north coasts of America, the Parry Archipelago, and Greenland. Occasional bands of Samoyedes frequent or inhabit Nova Zembla (q.v.), and miners occupy parts of Spitzbergen (q.v.). Exploration naturally turns to uninhabited portions, mostly to the north of the seventy-seventh parallel. The approaches to unknown Arctic regions are via Nova Zembla (see NORTHEAST PASSAGE), Spitzbergen (Greenland Sea), Franz Josef Land (Barents Sea), Lancaster Sound (see NORTHWEST PASSAGE), Smith Sound (West Greenland waterways), Bering Strait, and Arctic America.

The only north-polar voyage made via the Northeast Passage is that of F. Nansen (q.v.) in the *Fram* (1893-95). The ship was frozen in northwest of the New Siberian Islands, about 78° 50' N., 134° E., whence she drifted west-northwest to 85° 57' N., 70° E., and thence southwest to the Greenland Sea, where she escaped after a besetment of 35 months. Meantime Nansen, with Johansen, left the ship in an unsuccessful attempt to reach the pole, attaining 86° 04' N., 96° E., 7 miles north of the latitude of the *Fram*. The daring sledge men reached Franz Josef Land after travel of 153 days and limited the northeast extension of the archipelago by their journey. This expedition discovered a deep sea extending from 140° E. to 10° E., with a rich fauna. Occasional sounding reached 2000 fathoms.

Supplementary to the partial use of the Northeast Passage, initiated by Nordenskiöld (1875) as far as the Yenesei, and later pursued by Wiggins (1889 and later), Russia organized a hydrographic survey for the Siberian Ocean. This work has been pursued several years in the ice breakers *Taimyr* and *Viagatch*, operating via Bering Strait. In 1913 Vilkitsky, commanding the squadron, found his westerly way barred by ice at Cape Chelyuskin. Attempting to round the ice pack to the north, he discovered about 30 miles to the north a long island, 7 miles wide, running north and south. About 30 miles to the northwest was found another island, which terminated in about 81° N., 96° E. Landings were made on both islands, and geological specimens indicate that this archipelago, named Nicholas II Land (q.v.), is a continuation of the continent of Asia. Vilkitsky also discovered a small island on the northeastern edge of the New Siberian group, and, landing on Bennett Island, recovered the scientific collections of the late Baron Toll. In the summer of 1915 Vilkitsky made the first continuous passage from east to west. See VILKITSKY.

Hydrographically it is evident that Barents and Kara seas are inclosed, as doubtless other islands exist between Nicholas II Land and Franz Josef Land. Along the entire stretch of the continent of Asia exists a continental shelf, extending from 300 to 400 miles northward, dotted with various groups of small islands. Vilkitsky's soundings in 81° N., 96° E., ran from 10 to 100 fathoms; a short distance to the north the ocean probably deepens very rapidly.

Franz Josef Land (Barents Sea Route). While C. Weyprecht and J. Payer, two Austrians, were exploring Barents Sea (1872-74), their ship *Tegetthoff* was beset in 76° 22' N., 63° E., whence it drifted to the north for a year, and in August, 1873, the explorers saw an unknown region, Franz Josef Land. Before the retreat of the crew by boats to Nova Zembla (1874) the new land was explored by a sledge party. Payer's discoveries ran northerly through the centre of the archipelago and terminated at Cape Fligely, in about 81° 50' N., 58° E. Leigh Smith (1880, 1881) covered the southern coasts from 54° E. (Payer's westerly point) to 42° E., and while wintering at Cape Flora, after the loss of his ship, discovered the rich fauna and flora of these islands. Jackson, commanding the Harnsworth-Jackson expedition (1894-97), from his base at Cape Flora made extensive explorations between 42° and 56° E. and as far north as 81° 20' N. He

rounded Alexandra Land to the west and conclusively proved that Franz Josef Land consists of numerous islands of limited area, many covered by glaciers. It is here to be added that the discoveries of White Island (2000 feet high) by Kjeldsen (1876) and of New Iceland (also a frowning, snow-covered, lofty plateau) by Johannessen (1887) indicate that Franz Josef Land is merely an easterly extension of the great Spitzbergen Archipelago. Supplementing his Spitzbergen experiences (1894), Wellman renewed his attempts to reach the pole by a new route, Franz Josef Land (1898), when his subordinate Baldwin discovered Graham Bell Island, thus extending the limits of the archipelago to 65° E. In a north-polar attempt Prince Luigi Amadeo of Savoy reached (1899) in the *Stella Polare* 82° 04' N., northeast of Rudolph Island, and wintered in Teplitz Bay, 81° 47' N. He explored Austria Sound, while Captain Cagni on a polar journey reached 86° 34' N., 64° E.—then the most northerly point attained by man, within 206 geographical miles of the pole. The Russian expedition (1912) ended in the death of the commander, Sedoff, in the field.

Spitzbergen (Greenland Sea). In 1596 the Dutch Squadron, under Heemskerck and Ryp with Barents as chief pilot, discovered the islands of Bear and Spitzbergen, explored the west coast of the latter island as far north as 79° 49', Hakluyt Headland. In one of his remarkable voyages (1607) Henry Hudson, the English navigator, followed the west coast to 80° 23' N. (Conway shows that the latitude is overstated), crossed the Greenland Sea, discovered Hudson's Touches (now known as Jan Mayen), and sighted east Greenland in lat. 73° N. Hudson's discoveries and Poole's season (1610) in Spitzbergen led to a very lucrative whale fishery. Numberless whalers explored every sound and inlet of west Spitzbergen during the seventeenth and eighteenth centuries for commercial exploitation. Summer villages were even built, of which Smeerenburg, on Dane's Island, was the best known. The voyage of Carolus (1614) was notable, even if his claim to have reached 83° N. is clearly refuted by Conway. Carolus discovered Edge Island and was the first to report the separation of Greenland and Spitzbergen as evidenced by the great and constant southerly-drifting ice fields.

Efforts to explore the seas to the north of Spitzbergen have been singularly fruitless, owing to the ice-encumbered waters and the steady southward drift of the main ice pack of the Arctic Ocean. Phipps (1773) reached 80° 48' N., 20° E., only 25 miles beyond the point claimed for Hudson. Scoresby, the elder, attained (1806) 81° 30' N., 19° E., while Nordenskiöld and Otter (1868) reached 81° 42' N., 18° E. Parry in his remarkable boat and sledge journey (1827) pressed on to 82° 45' N., 18° E., the highest latitude ever attained in Spitzbergen water from the south—a world record for half a century.

Spitzbergen Archipelago. Scientific researches began in the archipelago with Clavering and Sabine (1824), followed by governmental expeditions of France—Fabre, Gaimard, Martins, and Marmier (1838); Russia and Sweden later measured an arc of the meridian (1898-1900). Expeditions have been so numerous that Conway names 87 principal voyages between 1855 and 1900. The most notable are:

Torrell and Nordenskiöld (1861) first explored Northeast Land; Carlsen (1861) first circumnavigated the Spitzbergen group; Koldewey (1868), first German expedition; Swedish polar expedition wintered at (1872-73) and Nordenskiöld first crossed Northeast Land; Leigh Smith rounded Northeast Land and reached 81° 30' N.; Swedish international polar expedition at Cape Thorsden (1882-83); Conway (1896) crossed by several routes the main island and surveyed 600 square miles of ice-free interior; Andrée established a balloon station at Danes Island and ascended (1896-97); Conway and Garwood explored interior of main island (1897); Nathorst (1898) circumnavigated Spitzbergen, landed on and explored Giles Land and Wiche's islands; Baron de Geer, ice flocks and glaciers (1908); Isachen, geological (1909); Zeppelin, climatology, etc. (1910); and the Monaco-Stoll, which crossed from Van Mijens (Low Sound) to Agardh Bay (1913).

The easterly extensions of Spitzbergen Archipelago include the lands of Giles (1707) and of Wiche (1617), which have given rise to endless discussions. Giles Land without much doubt is the same as the island reported as White Island and also as New Iceland. Giles Land was circumnavigated, visited, and explored geologically by Nathorst (1898). Wiche Land (q.v.), seen by Carolus (1614), earlier named by Edge, is sometimes called, after its largest island, King Charles.

For the commercial exploitation and industrial development of the Spitzbergen Archipelago, see SPITZBERGEN.

East Greenland Explorations. Northern voyages in early days were less successful in the western than in the eastern parts of Greenland Sea. Along the Greenland coast, however, whalers occasionally made high latitudes. Hudson saw the coast in 73° N. (1607), Hamke in 74.5° N. (1654), Ruys in 73.5° N. (1655), and probably Lambert in 78.5° N. (1670); but in those days little exactness was shown in observations. The earliest discoveries of importance were those of the Scoresbys, father and son. The elder Scoresby discovered and explored Scoresby Sound and adjacent inlets and also reached (1806) 81° 30' N., 19° E. William Scoresby, Jr., in intervals of whaling was indefatigable in explorations. As compared with other charts, those based on Scoresby's discoveries reduced the longitudinal extent of the east Greenland coast by three-fourths and determined the trend of the coast to be almost due north and south, between long. 19° and 25° W. He charted 800 miles of coast between 69° and 75° N. Wandel (1879) surveyed the coast between 66° and 69° N.

In the first expedition sent to this region Sabine and Clavering (1823) explored the coast from Pendulum Island to Shannon Island, 75° 12' N. Their successor, Graah (1829), followed the coast from Cape Farewell to near Cape Dan. Koldewey and Payer (1870) not only reached 77° 01' N. on the coast, but also explored Franz Josef Fiord, which penetrates five degrees of longitude to the interior, to 73° 11' N., 26° W. Local explorations and scientific researches were made by Nordenskiöld in King Oscar Harbor, Cape Dan (1883), and by Nathorst (1899) in King Oscar Fiord. At sea Naeko, a whaler, reached 75° 30' (1900) off the coast, but was surpassed by the Duke of Orleans, who (1905) reached 78° 16' N., re-

discovering Lambert Land, the most northerly verified latitude that has been reached by ship on this coast.

The systematic exploration of Greenland began under the Royal Greenland Commission in 1876 and has been pursued with a persistent success unparalleled in other governmental polar explorations. Its scope has covered botany, archaeology, ethnology, geology, hydrography, meteorology, zoology, etc., and its work has been so unusual as to have been 10 times recognized by award of medals. Between 1876 and 1912 54 expeditions were sent into the field, and their results have been published in 50 volumes, under the title *Meddelelser om Grønland*. Ten expeditions have explored east Greenland, on which region 15 volumes have been published, the most important being those of G. Holm, from Cape Farewell to 66° 25' N. (1883-85); Amdrup, from 65° 30' to 69° 25' N. (1898-1900); Ryder, from 69° to 74° N. (1891-92); and the *Danmark* (Mylus-Erichsen) expedition from 74° N. to 83° 30' N. (1906-08). Among important results were Holm's discovery of unknown Eskimo, about 600 souls, whose future has been safeguarded by Denmark through the establishment of a government station at Angmagssalik, a little south of Cape Dan. Among the geographical achievements, of which many are remarkable, has been the outlining of the entire coast of east Greenland from Cape Farewell to 83° 30' N., nearly 2000 statute miles in latitude, but nearer 5000 miles, as actually explored along the winding coast lines. Peary Channel has been eliminated, and the continuity of Greenland has been established to the most northerly point of land of the earth yet known.

As the first crossing of Greenland was from the east coast, such explorations are here summarized. Baron Nordenskiöld, after a failure (1870), starting from Auleitsivik, south of Disco, reached (1883) 68° 45' N., 43° W., an elevation of 6600 feet, only two-thirds across. First to cross was Nansen (1888), from Umivik, 64° 45' N., to Kangarsunak, south of Godthaab, the crest being about 8500 feet. Peary, after failing (1886), brilliantly crossed from McCormick Bay (1895) to Navy Cliff, 81° 37' N., 34° 5' W., at the head of Independence Bay, about 100 miles from the Greenland Sea, and returned over the same route. Again failing (1894), Peary repeated his crossing and recrossing to Navy Cliff (1895), though the feat nearly cost the lives of the party. Dr. De Quervain (1912) crossed from Jacobshavn to Angmagssalik, the summit in 8200 feet being one-third inland from Greenland Sea. Rasmussen (1912) made a more remarkable journey from Inglefield Gulf to Danmark Fiord, thence via Independence Bay to Navy Cliff and back to Wolstenholme Sound, the crest of the inland ice being 7200 feet. Lastly, Koch (1913) crossed the widest and most remote part of Greenland, from Queen Louise Land to Proven, south of Upernivik, finding the crest at about 9850 feet elevation, in 74° 30' N., nearer the western than the eastern sea. No part of the ice sheet of Greenland is 200 miles distant from parts explored. These journeys confirm the latest opinion that 95 per cent of the area of Greenland is ice-covered, and that no ice-free fertile interior valleys exist, as forecast by Nordenskiöld, and such as Greely discovered in the interior of Grinnell Land. In general, the crest of the inland ice is comparatively near the Greenland

Sea, though it bends westward between 70° and 75° N.

West Greenland Waterways (Smith Sound Route). In the first of his three voyages (1585) John Davis discovered Davis Strait, and after failure in 1586 in his third voyage of hazardous daring reached (1588) Sanderson's Hope, about 72° 12' N., and, turning his tiny sailing craft westward through the Middle pack, dreaded even to-day, reached the American coast. His discoveries included Greenland from Cape Farewell to Sanderson's Hope, and the American coast from Cumberland Gulf southward to Labrador. His successor, William Baffin, another great English sailor, in the *Discovery* of 55 tons, pushed yet farther north. Crossing Baffin Bay by the Middle Passage, he passed Cape York (1616), sailed north of Hakluyt Island, discovered Smith Sound, and turned back in sight of Cape Alexander. His latitude of 77° 45' N. was unequaled in these waters for 236 years. Baffin added to geographical knowledge the lands of Ellesmere and Prudhoe and the sounds of Jones, Lancaster, and Smith. In 1818, when English maps bore legends discrediting Baffin's discoveries, Capt. John Ross with two exploring ships turned homeward declaring that the sounds of Lancaster and Smith were closed bays. Inglefield (1859) reached 78° 28' N., off Cape Sabine, opened up Smith Sound, and penetrating Jones Sound charted 600 miles of unknown coasts. Kane (1853-55) pushed the *Advance* into Kane Sea to Rensselaer Harbor, 78° 03' N., 71° W., where the ship was abandoned, the party retreating by boat to Upernivik. Kane's discoveries covered the east coast of Grinnell Land to Cape Frazer, 79° 43' N., and along the Greenland shore to Cape Constitution, 80° 35' N., whence Kennedy Channel was visible. Hayes (1860-61), wintering the *United States* in Foulke Fiord, Smith Sound, penetrated the inland ice 50 miles. By sledge he followed the coast of Grinnell Land to the vicinity of Cape Goode, 80° 11' N. Hall in the *Polaris* (1871), opening up and navigating Kennedy and Robeson channels, was the first to enter the Arctic Ocean by this route, attaining 82° 11' N. Forced southward by ice, the *Polaris* wintered in Robeson Channel, on the Greenland coast under lee of a huge iceberg. He explored adjacent regions and charted Grinnell Land to its northern extremity, beyond the eighty-third parallel. Hall died (1871), and the *Polaris* was wrecked on its return voyage. Part of the crew, under Tyson (q.v.), drifted 1500 miles on ice fields and were rescued by the sealer *Tigress* off Labrador. Others of the crew, wintering at Polaris House, near Foulke Fiord, were rescued (1873) by a whaler near Cape York. Besides opening a route to the Arctic Ocean and to the North Pole, Hall discovered the termination of the inland ice at Petermann Fiord and the existence of several thousand miles of ice-free land to the north of the eighty-first parallel. Nares (1875) stationed one ship, the *Discovery*, in Lady Franklin Bay, while he pushed the *Alert* into the Arctic Ocean and wintered at Floeberg Beach, 82° 25' N., on the exposed coast of northeast Grinnell Land. Notable sled journeys were made: A. H. Markham on the Frozen Sea attained 83° 20' N., a world's record; P. Aldrich traced Grinnell Land to its northern cape (Columbia) in 83° 07' N. and thence followed westward to Cape Alfred Ernest, adding 220 miles of unknown coasts. From the

Discovery Archer explored Archer Fiord, and Beaumont, crossing Robeson Channel, extended the coasts of Greenland from Cape Bryant to Cape Britannia.

The United States sent the next expedition (1881-83), establishing under Lieut. (now Maj. Gen.) A. W. Greely an international polar station at Lady Franklin Bay, 81° 44' N. Its primary object was a series of simultaneous scientific observations covering the physical sciences—magnetic, tidal, pendulum, etc. Incidentally field explorations were made. The commander discovered and explored the ice-free interior of Grinnell Land, finding fertile valleys, plentiful animal life, and a glacier-fed lake (Hazen), and from the summit of Mount Arthur saw the western coast and possibly had a glimpse of Heiberg Land of Sverdrup (1901). Later Brainard and Lockwood, crossing Grinnell Land, traced the edge of the inland ice to the south, reached the sea on Greely Fiord, and discovered land to the westward to about 80° N., 83° W. In 1882 Lockwood and Brainard crossed Robeson Channel and by a long successful journey across the frozen sea extended Greenland to 83° 24' N., 40° 46' W., a world record, making known the most northerly land of the world. From the summit of the mountain near Cape Washington the landless, ice-clad sea was seen to the north of the eighty-fourth parallel. It was a world's record of nothing, and Peary's later journey shows that Greenland ends 14 miles farther north. During the retreat of the expedition, while wintering at Cape Sabine (1883-84), one of the party, F. Long, discovered Schley Land to the west, which indicated the probability of Hayes Sound being a closed bay—as it is. The geographic discoveries under Greely extended one-eighth of the way around the world north of the eightieth parallel and disclosed the fact that the Lake Hazen region was once permanently inhabited. The scientific work determined the secular variation of the magnetic declination for the Smith Sound region, determined climatic conditions, disclosed the unknown fact that the diurnal inequality of the tidal wave there conforms to the sidereal day, and made "a singularly successful determination of gravity." Sverdrup, failing in the *Fram* (1898-99) to circumnavigate Greenland, transferred his base to Jones Sound (1899-1902) and made extensive and important discoveries. He traced the shores northwestward to Svartevåg (renamed by Peary Cape Hubbard), within 60 miles of Aldrich's farthest (1876). Sverdrup also traced and explored the shores of three islands—Heiberg Land, extending from 79° to 83° W., and the Ringnes Islands, between 78° and 80° N., 92° and 106° W.

For a discussion of the discovery of the North Pole and other accomplishments of Peary, see PEARY, ROBERT EDWIN.

MacMillan's expedition (1913-15) planned the exploration of Crocker Land. From his base at Etah MacMillan crossed Grinnell Land by a new route and made an extended sledge journey to the northwest of Alex Heiberg Land. He extended about 50 miles our knowledge of the unknown Arctic Ocean, but it proved to be all sea. He crossed the site of the charted Crocker Land, reaching about long. 105° W., 83° 30' N., but no land was anywhere visible.

Lancaster Sound. This waterway, famous in connection with the Northwest Passage (q.v.), was discovered by Baffin (1616) and extended

westerly to the Arctic Ocean by Parry (1819) through Barrow Strait, Melville Sound, and Banks Strait. Wintering at Melville Island, Parry won the £5000 reward for passing the one hundred and tenth meridian, reaching 113° 48' W. This voyage was notable also as being the first made to the north of the magnetic pole, so that at one point the compass needle pointed due south. The loss of Franklin's squadron (1847) led to search expeditions through Lancaster Sound, with resultant discoveries of minor importance, the outlining of islands. Austin's squadron (1851) in journeys of 3340 miles, by Aldrich, W. H. Browne, Bradford, McClintock, Ommaney, and Osborn, added 670 miles of unknown coasts. Belcher's squadron (1852-53) made sledge journeys of 5900 miles, in which McClintock and Meham were leaders, with respective records of 1401 and 1163 miles. The most notable discoveries were those made by Collinson, McClintock, and McClure, the explorations of McClure adding Banks Land and Prince Albert Land, while McClintock's journeys covered Melville and Prince Patrick islands. Collinson, in his remarkable voyage (1851-54) along the northern coasts of America, explored the southern shores of Prince Albert, Wollaston, and Victoria lands.

Arctic America. The first land journey to the Arctic Ocean was that of Hearne (1771), who, joining an Indian war party, reached the mouth of the Coppermine, 67° 48' N. Alexander Mackenzie (1798), setting out to trace the waters of Slave Lake to the sea, with Indian guides reached, July 14, Whale Island, 69° 14' N., at the mouth of the great river that bears his name. The most notable man associated with the exploration of Arctic America is Franklin, who, cooperating on land with Parry at sea, pushed his advance base by winter journeys (1819-20) to Fort Enterprise, 64° 28' N, 113° W. Accumulating supplies on the Coppermine (1821), he reached the mouth of that river and explored the seacoast to the eastward to Point Turnagain, 68° 18' N, 109° W., turning back the same day that Parry sailed out of Repulse Bay, 539 miles to the east. Acting in concert with Beechy in Bering Strait and with Parry in Lancaster Sound, Franklin established his base (1825) at Fort Franklin on Great Bear Lake. Reaching the mouth of the Mackenzie, Franklin (1826) skirted the coast to the west and Richardson to the east. Franklin turned back at Return Reef, 70° 26' N, within 160 miles of Point Barrow. Richardson in a successful journey rounded Cape Bathurst, discovered Wollaston Land, and reached Cape Hope, 68° 58' N. He traced the continental coasts through 20 degrees of longitude and two of latitude, discovered a new land, determined tidal conditions, and made valuable physical observations.

Capt. George Back from his winter base (1833-34) at Fort Reliance, Great Slave Lake, discovered Great Fish (Back) River and explored the coast to the east of its mouth as far as the entrance to Simpson Strait. Dease and Simpson, operating from Fort Chipewyan (1837), reached Point Barrow to the west. Wintering at Fort Confidence (1838-39), they explored the continental coast to the eastward, discovering Simpson Strait and exploring the south shores of King William Land to Cape Herschel, 68° 41' N., 89° W. From Repulse Bay as a base, Rae virtually completed the coast

line of Arctic America by proving that Boothia Felix was a peninsular extension of the continent. A portion of the west coast of Melville Peninsula remained unknown, between the farthest of Rae (1846) and of Parry (1827), which was traced by C. F. Hall (1868) in his Franklin search. The northern coasts of America were searched by Richardson and Rae (1848-49) for news of Franklin, when Rae explored parts of Wollaston Land. Wintering at Repulse Bay, Rae in April, 1854, fell in with Eskimo, who gave the first news of the Franklin disaster, confirming their story of the retreat on King William Land by showing silver with the crest of Franklin and other officers. Schwatka and Gilder (1878-79) exhaustively searched King William Land, where new graves, skeletons, and relics of the Franklin expedition were found.

V. Stefánsson (q.v.), with Dr. R. M. Anderson (1908-12), under the auspices of the American Museum of Natural History, undertook the ethnological exploration of western Arctic America. From a base on Coronation Gulf Stefánsson traveled (living with the Eskimo) 1900 miles; 700 miles were through Victoria Land and adjacent regions unknown to white men. He found a tribe of so-called blond Eskimo, who never before had seen a white man; they lived in summer on Victoria Land and in winter on the ice of adjacent waterways, where seal were plentiful. Anderson's collections added much to a knowledge of the fauna and flora of these regions. Later (1913-14) Stefánsson commanded an expedition sent by the Canadian government to explore the Arctic lands to the north of the Dominion, with three ships and a body of scientists. Bad ice conditions prevented the *Alaska* and the *Mary Sachs* from proceeding farther to the east than Collinson Point, where Stefánsson and Anderson wintered. The besetment of the *Karluk* caused the failure of the main purpose of the expedition—to explore the regions to the west of the Parry Islands. Beset in 70° 47' N., 150° W., the *Karluk* drifted from Sept. 22, 1913, to the northwest in 73° N., 162° W., having crossed a section of deep water, about 1200 fathoms. She turned to the southwest and, crushed by the ice, sank on Jan. 11, 1914, in about 71° 30' N., 175° W., some 60 miles N. by E. of Herald Island. Two parties of four men disappeared in making their way to Herald Island, but the remainder, under Captain Bartlett, reached Wrangell Island with supplies February 18. Late in March Bartlett, with one Eskimo, crossed Long Strait to Asia and through the aid of a Russian official, Baron Kleist, reached Providence Bay, Siberia. Two men died on Wrangell Island, but the survivors were rescued by Swenson, in the *King and Wing*, on September 7.

Undaunted by the loss of the *Karluk*, Stefánsson with a small supporting party left Martin Point, Alaska, in April, 1914, on his forlorn sledge journey over the frozen Arctic Ocean, here known as Beaufort Sea. He had the double purpose of locating the continental shelf north of Alaska and of exploring the vast region of unknown lands. When his supporting sledge turned back, about 75 miles from the coast, the soundings indicated the edge of the continental shelf, the sea deepening from 34 to 70 and then to 180 fathoms. Prudence would have dictated Stefánsson's return also, but his previous successful experiences caused him to rely

on the supplementing of his scanty food supplies by sea game until land was reached. He took two men, one sledge (with canvas cover for crossing water leads), two months' provisions, and ample ammunition. Thus equipped, he started north in search of the land—forecast by Greely as the birthplace of Arctic floebergs and by Harris as the causation of abnormal tides in the Arctic Ocean.

Stefánsson's journey and successes are among the marvels of polar exploration. From April, 1914, till June, 1915, he lived on the pack, obtaining much sea game. From Prince Patrick Island, the northwest point of Parry Archipelago, he traveled north on the ice and on June 18, 1915, discovered a rugged unknown land in lat. 78° N., long. 117° W., and observed 100 miles of its coasts—thus indicating an area of considerable extent. The portion of the new land seen is directly north of Prince Patrick Island, some 40 miles from McClintock's farthest (1852) and about 100 miles due west of Ringnes Land discovered by Isachen under Sverdrup (1901). The new land of Stefánsson is a westerly extension of the great Arctic Archipelago, of which Grinnell Land is the most northeasterly and most important known land. Probably its western extension will end in an equally large land area. Stefánsson continues his explorations, departing from Herschel Island Aug. 23, 1915.

Bering Strait. Last and least important of north-polar routes is that through Bering Strait. Doubts have been expressed as to the alleged voyage (1648) of Deshneff from Kolima, on the north coast of Asia, through Bering Strait. Bering (1728) added nothing as to northern Alaska, which was visited by Gwosdef (1731). The great English sailor, Cook, reached (1778) Icy Cape, 70° 44' N., and Kotzebue discovered (1826) Kotzebue Sound, not seen by Cook. Though Beechey's ship turned back (1826) from the seventy-first parallel, his boats under Elson reached Point Barrow, the most northerly land of that region. Collinson, Kellett, and McClure are mentioned under the Northwest Passage (q.v.). Rodgers made a record (1855) for latitude in that sea by reaching 72° 05' N., 164° W., since surpassed by the *Karluk*. American whalers have actively navigated these waters, and De Long (1867) first sailed along the land reported by and named after Wrangell. De Long's north-polar expedition (1879-81) added much to a knowledge of these regions. Beset in the pack, his ship, the *Jeannette*, drifted westward off the north coast of Wrangell Land, disproving the theory that it was a continent reaching to the pole. Drifting west by north, the De Long Islands, a northeast extension of the New Siberian Archipelago, were discovered and visited by Melville (1881). After the *Jeannette* was crushed the drift carried De Long, while retreating to the Siberian shore, as far northward as 77° 36' N., 155° E., the most northerly point ever reached in the Siberian Ocean from Bering Strait. Nansen's successful continuation of the drift project of De Long is noted under the Northeast Passage (q.v.).

ANTARCTIC EXPLORATIONS

The continent of Antarctica, ice clad, uninhabited, devoid of land fauna, and desolate, has in late years been the centre of exploring activities. This continent existed hypothetically

for many centuries, until James Cook (1773-74) eliminated it from the maps. Entering the Antarctic circle at four widely separated points, his southernmost position was $71^{\circ} 10' S.$, $107^{\circ} W.$, but he found only ice-strewn seas and no land. For convenience the southern regions are divided into four quadrants, named from the three continents and the ocean directly to their north—Africa, America, Australia, and Pacific. Early reconnaissance maps of these lands are being gradually replaced by more accurate documents. Scott's and Mawson's expeditions both yielded noteworthy cartographic results, based on the use of the theodolite and plane table.

Continent of Antarctica. This land is distinctive from all other continents in several respects. Its area is estimated at over 5,000,000 square miles. It has the highest elevation, and its climate is exceedingly harsh; it has no land fauna and practically no flora; it exhibits no remains of previous human life; it is the relic of the great Ice age on an extended scale and is fringed by a succession of great oceanic ice caps, not found elsewhere. Omitting minor indentations, but not including the seaward boundary of fast ice, its coast line is not less than 14,000 miles long. Its average elevation exceeds 2000 feet as against 800 feet for Asia. The central south-polar plateau, more than 10,000 feet above the sea, is bounded by mountain ranges with summits rising to 15,000 feet or more. Only rare mountain peaks and occasional shore cliffs are snow-free. The continental ice sheet is of unknown thickness, but it is thought to reach 2000 feet in places, while in ages past it must have been more than 1000 feet thicker. Including the ice cap, the mean altitude of Antarctica is estimated at 3000 feet. At Commonwealth Bay, Adellie Land, the average wind velocity for an entire year was 50 miles an hour and for days exceeded 100 miles hourly. The mean temperature of the south-polar plateau has been estimated as approaching -40° . The very steep gradients along the coasts accelerate the downward flow of the glacial streams, which thus extend in unbroken form over great areas of the sea, the oceanic surfaces thus covered ranging from hundreds to tens of thousands of square miles in extent. Antarctic geology is in a stage of evolution, and the beacon sandstone series of the Australian quadrant, with the fossil contents, is most important. Scott's and Mawson's collections of fossils in that quadrant, and Nordenskiöld's from the American quadrant, should throw much light on the two important geological problems of the Antarctic—the climate of past ages and the former distribution of sea and land, especially as to the former connection of Antarctica with continents to the northward.

African Quadrant (from long. 0° to $90^{\circ} E.$). This might well be called the unknown region, as no one has reached a latitude of $70^{\circ} S.$ and no land of extent has been therein seen. Cook (1772) barely crossed the circle, to $67^{\circ} 15' S.$, $38^{\circ} E.$ Bellingshausen (1820) followed virtually the circle across the whole quadrant and, sailing 16 degrees of longitude within it, reached $69^{\circ} 21' S.$ in $2^{\circ} 14' E.$, $66^{\circ} 53' S.$ in $41^{\circ} E.$ and $69^{\circ} 06' S.$ in $10^{\circ} 43' E.$ Morrell (1823), whose positions are questioned, reached $69^{\circ} 11' S.$, $48^{\circ} 15' E.$; doubtless his longitudes are incorrect, as were those of many contemporaries. Biscoe (1831) sailed to $69^{\circ} S.$, $11^{\circ} E.$, and discovered Enderby Land in about 66°

$25' S.$, $49^{\circ} E.$ Kemp (1833) discovered land, named after him, in $66^{\circ} S.$, $59^{\circ} E.$ Moore (1844) claims land in $64^{\circ} S.$, $49^{\circ} E.$ Nares in the *Challenger* (1874) barely crossed the circle in $78^{\circ} 22' E.$, but saw no land. His dredge nets, however, gathered such wealth of widely dispersed, continental rock fragments as enabled Murray definitely to forecast the existence of the continent of Antarctica. Drygalski's (1902) Kaiser Wilhelm Land, $87^{\circ} E.$ to $94^{\circ} E.$, being partly in the Australian quadrant, is treated therewith.

American Quadrant (from long. 0° to $90^{\circ} W.$). The continent of Antarctica has its most northerly extremity in this quadrant. Its discovery was credited to Nathaniel B. Palmer, an American sealing captain from Stonington, Conn., who from the home station on the South Shetlands sailed southward (1820) to the new land, 60 miles to the south. This discovery was charted on the Powell map (1822) as Palmer Land, but the name was unwarrantably changed 10 years later to Graham Land by the British Admiralty. Bellingshausen (1819-21) discovered two islands (January, 1821), Peter I and Alexander I. Through other explorers Palmer Land has grown into continental dimensions, so that its extreme limits as now known extend from lat. 63° to $70^{\circ} S.$ and long. 52° to $77^{\circ} W.$ Biscoe (1831), reaching $67^{\circ} S.$, $72^{\circ} W.$, discovered Biscoe Islands. D'Urville (1838) renamed parts of the region as Joinville and Louis Philippe Land, and Ross (1843) added Cockburn Island. Explorations long ceased, but the whaler Dallmann (1873) entered Bismarck Sound, later proved to be a bay, in $64^{\circ} 45' S.$ Robertson (1892) added Dundee Island. Larsen (1893) found sedimentary fossils on Seymour Island and extended the east coast of Palmer Land to $68^{\circ} 10' S.$, under the name of King Oscar Land. De Gerlache (1897), through a drift of 14 months from $80^{\circ} W.$ to $102^{\circ} W.$, reached $71^{\circ} 31' S.$, where a sounding of 210 fathoms indicated that the ship was on the continental shelf. Gerlache Strait and Danco Land were discovered, and the drift was south of Peter I Island. Evensen (1893) reached $69^{\circ} 10' S.$, $76^{\circ} 12' W.$, approaching very near to Alexander Island, and skirting the glacier-covered coasts of West Palmer Land. Norden-skiöld (1902-03) discovered on Seymour Island two floras, Jurassic and Tertiary, and explored the east coast of Palmer Land to $66^{\circ} S.$ Charcot (1903, 1910) in two voyages extended Palmer Land to the southwestward. He discovered two new regions, Loubet Land and Charcot Land—the latter in $70^{\circ} S.$, $77^{\circ} W.$ He navigated the *Pourquoi Pas?* also from 60° to $124^{\circ} W.$, his course being mostly between lat. 69° and $70^{\circ} S.$ and through much sea that was unknown. Most important, he proved conclusively the continuity of Palmer Land, which some geographers had believed to be bisected by straits. It may be added that the fisheries of this region have so greatly developed lately as to involve millions of dollars of values annually, and that Great Britain has assumed control, by proclamation, of the regions south of the fiftieth parallel and between long. 30° and $80^{\circ} W.$

The southward extension of a great bight (Weddell Sea) was discovered by Weddell (1823) to reach to $74^{\circ} 15' S.$, $34^{\circ} 17' W.$, 185 miles south of Cook. It was extended in area by Ross (1843) and by Bruce (1903), who reached $70^{\circ} 25' S.$ Later Bruce (1904)

navigated the sea to the southeast, reaching 74° 01' S., 22° W., and discovered unknown territory, Coats Land, which extends from 72° to 74° S. and between 17° and 23° W. Further extensions were made by Filchner (1912), who discovered new land, named Prince Luitpold, in 78° S., between 33° and 38° W. It is this last-named land that is serving as the home (starting) base of Shackleton, who, after there wintering (1915) and exploring adjacent lands, begins his transantarctic journey to the shores of Ross Sea in the Australian quadrant. Such a journey will definitely settle the moot point as to the continuity of Antarctica, which a very few geographers believe to be bisected by a strait.

Australian Quadrant (from 90° E. to 180° E.). As the easiest route to the pole and as presenting the most interesting and extended portions of Antarctica, the Australian quadrant is of special importance. Yet it was the last to be explored, as neither of the great navigators, Cook and Bellingshausen, entered the circle herein. Balleny (1839) discovered in about 165° E., 67° S., a group of five islands to which his name is attached. His Sabrina Land, reported as in 65° S., 121° E., does not exist. The earliest voyage of importance in these seas was that of the United States squadron under Charles Wilkes, which (1840) virtually followed the Antarctic circle through ice-filled seas about 50 degrees of longitude, from 155° E., 66° 20' S., to 106° E. At various points land was seen—the first on Jan. 19, 1840, though there was much uncertainty as to whether later certain earth-stained oceanic ice caps were not mistakenly viewed as ice-covered land. Wilkes skirted 1600 miles of this glacier-faced region, the ice cliffs rising from 50 to 200 feet high along the continental shelf, which his soundings clearly indicated. Probably his longitudes were somewhat in error, but Mawson's discoveries show the continent that Wilkes first reported is in existence. Simultaneously D'Urville with a French squadron explored (1839-40) these seas and on Jan. 20, 1840, discovered Adélie Land, about 700 miles distant from Wilkes at the time. D'Urville's Côte Clarie proves to have been a projecting glacier, or oceanic ice cap, which had disappeared before Davis (1912) explored this region. Wilkes's discoveries were discredited for 60 years, when Drygalski (1902), wintering in the Antarctic pack off Gaussberg, discovered Kaiser Wilhelm Land, on the Antarctic circle between long. 87° and 93° W., a westerly extension of the continent of Wilkes. Later Shackleton (1909) extended the north coast of Victoria Land to a point 45 miles west of Cape North. Scott's last expedition (1912) discovered Oates Land, a westerly extension of Victoria Land, in 70° S., between 162° and 158° E.

It remained for an Australasian expedition, under Douglas Mawson (q.v.), to explore (1911-14) the debatable region between 93° E. and 158° E. Mawson established his base at Commonwealth Bay, Adélie Land, 67° S., 143° E., and his comrade Wild occupied another in 66.7° S., 97° E., on the Shackleton Oceanic Ice Cap. Mawson discovered and explored King George V Land as far south as lat. 70° 30' S. and between long. 138° and 152° E. Wild explored the new Queen Mary Land between 101° 30' E. and Gaussberg in 88° 45' E. By ship Davis traced the continental shelf and discovered un-

known land between Mawson and Wild. Altogether the northern coasts were traced through 55 degrees of longitude and Wilkes's continent placed beyond dispute. Indeed, it is quite unquestioned that Antarctica is a continuous land between Kaiser Wilhelm Land of Drygalski in 86° E. and Carmel Land of Amundsen in 158° W., a stretch of 116 degrees of longitude. The new lands of Mawson, save rare peaks and cliffs, are entirely covered with glacial ice sheets of great thickness, which move constantly seaward. At various points glaciers push unbroken into the sea, forming true oceanic ice caps. The Mertz and Ninnis glaciers of King George Land each cover more than 1000 square miles of ocean. Most remarkable is the Shackleton Ice Cap, which covers 36,000 square miles of the Antarctic Ocean, being 180 miles north and south by 200 miles east and west, its average thickness was about 600 feet. Most marvelous of all these ice caps is that known as Ross's Barrier, situated in the light between the lands of Victoria and Edward VII. While Scott tentatively estimates its surface area at 120,000 square miles, it probably does not fall below 100,000 square miles, a surface area greater than that of the two States of New York and Pennsylvania.

The discovery most prolific in the extension of Antarctic lands was that of J. C. Ross (1841). He carried Victoria Land from Cape North, about 70° 30' S., to 78° S. and added that wonderful remnant of the Ice age, the Ross Oceanic Ice Cap, which he called the Barrier, and where he reached lat. 78° 10' S., long. 161° 27' E., a southing 235 miles beyond that of Weddell. The Ross Ice Cap presented an unbroken series of ice cliffs 350 miles in sea front and rising from 100 to 200 feet above the sea. Borchgrevink (1900) reached 78° 50' S., 164° E., after wintering at Cape Adare—the first winter passed by man within the Antarctic circle. Then followed three historic British expeditions, whose advances were most brilliant and whose valuable scientific contributions are by far the most important in Antarctic records.

Scott (1901-03) (q.v.) eliminated the Parry Mountains of Ross, and sailing along the Ross Ice Cap discovered to the east of it King Edward VII Land, trending northeast between long. 152° and 153° W. In an attempt to reach the pole Scott made (1902) a record southing in 82° 17' S. This was on Ross Ice Cap, which was unchanged in appearance and in elevation 380 miles southward of his ship. A journey of 300 miles to the interior of Victoria Land disclosed unbroken glacial regions, increasing in elevation to the south. Shackleton (1909), from his base at the west end of the Ross Ice Cap, made an extraordinary sled journey, in which he reached 88° 23' S., about 162° E. His farthest was within 97 miles of the South Pole, 366 miles beyond the record—the greatest advance made by any man within the Antarctic circle. Finding a mountain range in 83° S. barring his progress, he ascended Beardmore Glacier—a rise of 6000 feet in 100 miles—and emerged on the great ice-clad south-polar plateau which is about 11,000 feet above the sea. His assistants, David, Mawson, and Mackay, located approximately, through a journey of 200 miles inland, the south magnetic pole in 72° 25' S., 155° 16' E. The geological collections show a former milder climate, with exten-

sive vegetation near the pole, and should reveal information as to the structure of Antarctica. Scott's last expedition (1911-13) had a tragic ending in the death of Scott and four others on their return from a successful sledge journey to the South Pole. The ill-fated expedition attained its goal on Jan. 18, 1912, only to find by the records left by Amundsen (q.v.) that he had preceded them by 35 days. The discoverer had written a letter directed to whoever should reach the pole after him, giving proof of his priority in the achievement. The missive was left in a tent which Scott duly photographed, after making note of the contents of the message that it sheltered. Scott's polar trip was not unproductive, for the fossils gathered by his party and dragged on to the end, at an eventual cost of their lives, should do much under expert discussion to determine the past geological history of Antarctica. Scientific data gathered elsewhere by the expedition promise important conclusions in other branches of knowledge.

Amundsen's journey (1911-12), frankly acknowledged to have been made only for the attainment of the pole, was carried out with magnificent precision. In a sledge trip from the edge of the Ross Oceanic Ice Cap, where he had wintered, Amundsen reached the South Pole, after a journey of 870 miles, Dec. 14, 1911. The pole is on a plateau 10,500 feet in elevation, with no mountains near. Amundsen crossed two mountain ranges, Dominion and Queen Maud. His most important discovery is the southerly termination of the Ross Oceanic Ice Cap, in 85° S., 164° W., thus proving the probable continuity of Antarctica by joining Victoria Land and Edward VII Land. His assistant Prestrud explored parts of the last-named region and gives to his discoveries the name of Carmel Land, in about 82° S., 150° W. Edward VII Land was visited by a Japanese expedition (1910-11) under Shirase, who succeeded in penetrating the land to some distance.

Pacific Quadrant (from 90° W. to 180° W.). In this great southerly extension of the Pacific Ocean there is no known land in the Antarctic regions between 90° W. and 150° W., although several explorers have entered the quadrant. Cook (1774) entered the circle at 147° W. and in 106° 54' W. reached 71° 10' S. Bellingshausen here excelled, reaching (1820-21) 67° S. in 164° 34' W., 67° 30' S. in 120° W., and 60° 53' S. in 92° 19' W. Walker (1839) reached 70° S. in 105° W. Ross (1841) attained 67° 29' S. in 159° W. Charcot's southing and Gerlache's drift appear under the section *American Quadrant*, and King Edward VII Land, being a continuation of Victoria Land, has been treated under the section *Australian Quadrant*.

Bibliography. Arctic: George Vancouver, *A Voyage of Discovery to the North Pacific Ocean* (4 vols., London, 1798); Sir John Franklin, *First and Second Journey to the Shores of the Pacific Ocean* (ib., 1824-28; new ed., with title *Narrative of a Journey to the Shores of the Pacific Sea in the Years 1819-22*, New York, 1910); W. E. Parry, *Narrative of an Attempt to Reach the North Pole* (London, 1828); T. Rundall, *Narrative of Voyages towards the North West in Search of a Passage to Cathay and India, 1496-1631* (ib., 1849); J. F. J. de Payer, *New Land within the Arctic Circle* (2 vols., ib., 1876); Sir G. S. Nares, *Narrative of a Voyage to the Polar Sea* (3d ed., 2 vols., ib.,

1878); *Meddelelser om Grönland* (50 vols., Copenhagen, 1879-1914), by various authors; E. K. Kane, *Arctic Explorations: The Second and Last Grinnell Expedition* (Hartford, 1881); N. A. E. Nordenskiöld, *Voyage of the Vega* (Eng. trans. by Alexander Leslie, London, 1883); G. W. De Long, *Voyage of the Jeannette* (2 vols., Boston, 1884); A. W. Greely, *Three Years of Arctic Service* (2 vols., New York, 1886); Fridtjof Nansen, *Farthest North* (2 vols., London, 1897); R. E. Peary, *Northward over the Great Ice* (2 vols., New York, 1898); Duke of Abruzzi, *On the Polar Star in the Arctic Sea* (2 vols., ib., 1903); Otto Sverdrup, *New Land* (2 vols., ib., 1904); J. D. Hoare, *Arctic Exploration* (London, 1906); Anthony Fiala, *Fighting the Polar Ice* (ib., 1906); W. J. Peters, *The Zeigler Polar Expedition, 1903-05* (Washington, 1907); R. E. Peary, *Nearest the Pole* (New York, 1907); R. E. G. Amundsen, *The North West Passage: Being the Record of a Voyage of Exploration of the Ship Gjøa, 1903-07* (2 vols., London, 1908); R. E. Peary, *The North Pole: Its Discovery in 1909* (New York, 1910); A. W. Greely, *Handbook of Polar Discoveries* (5th ed., Boston, 1910); Fridtjof Nansen, *In Northern Mists* (2 vols., New York, 1911); F. A. Cook, *My Attainment of the Pole* (ib., 1912); Kristian Birkeland, *The Norwegian Polaris Expedition, 1902-03* (2 vols., Christiania, 1913). Antarctic: Charles Wilkes, *Narrative of the United States Exploring Expedition during the Years 1838-1842* (5 vols., New York, 1856); D'Urville, *Voyages au pôle sud* (Paris, 1841); Sir J. C. Ross, *Voyage of Discovery in the Antarctic Regions in 1839-43* (2 vols., London, 1847); F. A. Cook, *Through the First Antarctic Night* (New York, 1900); K. Fricker, *Antarctic Regions* (Eng. trans. by A. Sonnenschein, London, 1900); Louis Bernacchi, *To the South Polar Regions* (ib., 1901); C. E. Borchgrevink, *First on the Antarctic Continent* (ib., 1901); Neumayer, *Auf zum Südpol* (Berlin, 1901); Henryk Arctowski, "The Antarctic Voyage of the *Belgica* during the Years 1897-99," in *Smithsonian Institution, Annual Report, 1901* (Washington, 1902); E. S. Balch, *Antarctica* (Philadelphia, 1902); Erich von Drygalski, *Zum Kontinent des eisigen Südens* (Berlin, 1904); H. R. Mill, *Siege of the South Pole* (New York, 1905); A. B. Armitage, *Two Years in the Antarctic* (ib., 1905); N. O. G. Nordenskiöld, *Antarctica* (London, 1905); J. B. Charcot, *Journal de l'expédition antarctique française, 1903-05* (Paris, 1906); id., *Le Français au pôle sud* (ib., 1906); R. F. Scott, *Voyage of the Discovery* (2 vols., New York, 1907); J. B. Charcot, *Voyage of the Why Not? in the Antarctic* (Eng. trans., New York, 1911); R. E. G. Amundsen, *The South Pole: An Account of the Norwegian Antarctic Expedition in the Fram, 1910-1912* (2 vols., ib., 1913); Murray and Marston, *Antarctic Days* (London, 1913); R. F. Scott, *Scott's Last Expedition*, arranged by Leonard Huxley (2d ed., 2 vols., ib., 1913); E. H. Shackleton, *Heart of the Antarctic* (new ed., 2 vols., Philadelphia, 1914); Sir Douglas Mawson, *Home of the Blizzard* (2 vols., ib., 1915); Charles Turley, *Voyages of Captain Scott* (New York, 1915). In addition to the above the files of the *Geographical Journal*, *Petermann's Mittheilungen*, and the *Bulletin of the American Geographical Society* can always be consulted to advantage.

POLAR WHALE. The Greenland or "right" whale. See **WHALE**.

POL DE MONT, pól de món (properly KAREL MARIE POLYDOOR DE MONT) (1857-). A Flemish poet and critic, born at Wambeke, Brabant. He was educated at the University of Louvain and became professor of the Dutch language and literature in the Athenæum at Tournai and (1882) at Antwerp. After 1886 he was also professor of the history of literature at the Académie des Beaux-Arts, Antwerp, and after 1904 curator of the museum. His chief works are: *Waarheid en Leven* (1877); *De eerste mensch* (1879); *Lentesotternijen* (1881); *Loreley* (1882); *Fladderende Vlinders* (1885); *Claribella* (1893); *Iris* (1894); *De Amman van Antwerp* (1901); *Vier Vlaamsche Legendes* (1904); also biographies of Hendrik Conscience (1883) and of Jan van Beers (1886).

POLDER, pól'dér (Dutch, morass). A name given in the Netherlands to that portion of dry land which was formerly below the level of the sea or the nearest river and has been reclaimed by building a dike, called a ringvaart, around the region to be drained and brought under cultivation. On such an embankment machinery for lifting water is placed and worked by wind or steam power. Successive embankments and canals are built as the work proceeds. In North Holland in the Schermer polder four such embankments and intermediate canals were necessary in order to reclaim the lowest part of the polder. A large portion of the cultivated land of the Netherlands has thus been reclaimed from the ocean. The largest of the finished polders is that which occupies the former site of the Haarlem Lake and covers about 50,000 acres, or about 80 square miles. At present still larger polders are in the course of being drained.

POLE. In geography, one of the two extremities of the axis round which the earth revolves. They are therefore situated the one on the north and the other on the south side of the equator, and equidistant from all parts of it, or in lat. 90° north and lat. 90° south, respectively. They are called the north and south poles of the earth. In astronomy, the poles, which, for distinction's sake, are denominated celestial poles, are those points in the heavens to which the earth's axis is directed and round which the heavens seem to revolve. The celestial poles are valuable points of reference to astronomers and geographers, so that the determination of their position in the heavens is a matter of the greatest importance. Unfortunately, no stars mark their exact situation (see POLESTAR), though there are minute telescopic stars only a few seconds from the north pole. The position of the polar point is determined as follows: a bright star (usually the polestar) is selected, and its position in its upper and its lower culminations (q.v.) is accurately noted, with the meridian circle (q.v.); the point midway between these two positions of the star is the pole of the heavens. The observation of the two positions of the star must be corrected for refraction, and it is for this reason that the polestar is selected, since the effect of refraction is much the same in both positions of the star. The term "pole" has, however, a wider application in astronomy, as in spherical geometry, denoting the extremities of a line passing through the centre of a great circle perpendicular to its plane; thus, we have the poles of the horizon (zenith and nadir), the poles of the ecliptic, the poles of a meridian. Pole in physics denotes those points of a body at which

its attractive or repulsive energy is concentrated. See TERRESTRIAL MAGNETISM.

POLE, MATTHEW. See POOLE, MATTHEW.

POLE, OF A MAGNET. See MAGNETISM.

POLE, REGINALD (1500-58). Cardinal, Papal Legate, and Archbishop of Canterbury. He was born at Stourton Castle, Staffordshire, in March, 1500, the son of Sir Richard Pole, by Margaret, Countess of Salisbury, daughter of the Duke of Clarence, the brother of Edward IV. His early education was received from the Carthusians at Sheen, whence, being liberally provided for by Henry VIII, he passed to Magdalen College, Oxford, and, although still a layman, received several valuable preferments through the favor of the King. For the further prosecution of his studies he went, in 1521, to the University of Paris, and thence to Padua, where he formed the friendship of a distinguished group of scholars and others, all of whom subsequently took a leading part in public affairs—Contarini, Bembo, Sadoleto, and others. In 1527 he returned to England, where the highest ecclesiastical dignities awaited his acceptance. In 1529-30 he was in Paris, where, reluctantly obeying royal orders, he collected opinions favorable to Henry VIII's divorce from Catharine of Aragon, but on his return he courageously endeavored to dissuade the King. In 1532 Pole was again on the Continent, whence he issued his *Pro Ecclesiasticæ Unitatis Defensione* (1536), taking strong grounds against the divorce. At the end of 1536 he went to Rome, where he was ordained deacon and made Cardinal. In February, 1537, he was appointed Papal Legate to England, but his commission was not then discharged. His position had greatly enraged Henry, whose resentment fell upon Pole's elder brother and upon his aged mother, the Countess of Salisbury. During the rest of Henry's reign Pole remained in exile. The papacy, for the maintenance of whose authority in the cause of the injured Catharine Pole was regarded as a martyr, treated him with distinguished favor. He was employed in many affairs of the highest importance, being sent as Legate, in 1537, to France and the Low Countries, from both which states Henry VIII in vain demanded his extradition. He also took an active part in the discussion on the Interim, and when the Council of Trent was opened he was appointed one of the three legate presidents who acted in the name of the Pope, Paul III. He was influential in molding the decrees, especially those on sin and justification. On the death of Paul, in 1549, Pole was all but elected to succeed. For some time after this he resided chiefly in a monastery, near Verona, in comparative retirement, until the accession of Mary called him back to active life as the main instrument of the reconciliation of England with the papacy. On Nov. 24, 1554, Pole solemnly entered London as Legate, possessing in equal degree the confidence of the Queen. In the arduous charge thus intrusted to him he acquitted himself with much prudence and, considering the circumstances of the time, with singular moderation. In the severities which marked the later history of Mary's reign it is all but certain that Pole had no share. He was ordained priest March 20, 1557, and consecrated Archbishop of Canterbury two days after, and later made chancellor of the universities of Oxford and Cambridge. On the difficult and critical question of the disposal of the Church property confiscated by Henry VIII, Pole, who saw the necessity of moderation, was

or a time at issue with the Pope; but his representations were successful in producing a more moderate policy, and the work of reunion appeared to proceed with every prospect of a complete and permanent issue, when it was interrupted by the death of the Queen, Nov. 17, 1558. Pole died within 12 hours after. Besides the treatise *De Unitate*, already mentioned, he is also the author of a book *De Concilio* and of other treatises on the authority of the Roman Pontiff and the Reformation of England, and of many important letters, full of interest for the history of the time, edited by Quirini (5 vols., Brescia, 1744-57).

Bibliography. T. Phillips, *History of the Life of Reginald Pole* (2 vols., Oxford, 1764), the earliest English life and still valuable; A. M. Stewart, *Life of Cardinal Pole* (London, 1882); F. G. Lee, *Reginald Pole, Cardinal Archbishop of Canterbury. An Historical Sketch* (ib., 1888); Athanasius Zimmermann, *Kardinal Pole: sein Leben und seine Schriften* (Regensburg, 1893); James Gairdner, *The English Church in the Sixteenth Century* (London, 1903); Martin Haile, *Life of Reginald Pole* (New York, 1910).

POLE, RICHARD DE LA (?-1525). A pretender to the English crown, the fifth son of John de la Pole, second Duke of Suffolk, and of Elizabeth, the sister of Edward IV. In 1501 he escaped to the Continent with his brother, Sir Edmund, was attainted in 1504 by Parliament, was recognized as King of England by Louis XII in 1512, and fought for France in Spain and the Netherlands. He was excepted from the general pardon of Henry VIII on his accession in 1509. After France and England made peace in 1514 he resided for five years at Metz. In 1523 he made plans to invade England with the aid of the Scots. He was killed in the battle of Pavia at the side of Francis I.

POLE, WILLIAM (1814-1900). An English engineer, musician, and writer on whist. He was born at Birmingham, studied engineering there, became professor of engineering at Elphinstone College, Bombay (1844), and in 1850 was employed in calculations for the Menai Straits Bridge. After acting as assistant to James Meadows Rendel and to Sir John Fowler (q.v.) he entered business independently in 1858, and in 1871 was made consulting engineer of the Japanese government. He was a prominent musician, being musical examiner in London University from 1878 to 1891, and as an authority on whist ranks with Henry Jones. He was the father of a dramatist who changed his name from William Pole, Jr., to William Poel (q.v.). Pole's works are: *On the Strength and Defects of Beams* (1850); *The Theory of Modern Scientific Games of Whist* (1865 and often); *Iron as a Material of Construction* (1872); *The Philosophy of Music* (1877; 4th ed., 1895); *Mozart's Requiem* (1879); *The Philosophy of Whist* (1883 and often); *Life of Siemens* (1888); *The Evolution of Whist* (1895).

POLE, WILLIAM, JR. See POEL, WILLIAM.

POLE AND POLAR. The secant drawn through the points of contact of two intersecting tangents to a conic is called the polar of the point of intersection with respect to the conic, and the point is called the pole of the secant. Any secant of a conic through a given point O is cut harmonically by the curve and the polar of O . Two points are said to be conjugate with respect to a conic when each lies on the polar of the other. Two straight lines are said to be

conjugate with respect to a conic when each passes through the pole of the other. Thus, conjugate diameters are conjugate lines through the centre. When the pole is inside the conic the tangents are imaginary and the polar line fails to cut the conic in real points. In this case the locus of the harmonic conjugate of the pole serves as a more suggestive definition of the polar. If the pole is on the conic the polar becomes a tangent at the pole. The polar of the focus is the directrix in the ellipse, hyperbola, and parabola (qq.v.).

A few of the relations which give remarkable power to the theory of polars in the domain of geometry are: 1. The polars of collinear points with respect to a conic are a pencil of lines passing through the pole of the line, and conversely. 2. If the vertices of a triangle are the poles of the sides of another triangle, the vertices of the latter are the poles of the sides of the former. Such triangles are said to be conjugate to each other with respect to the conic. 3. If the sides of a triangle are the polars of its own vertices, the triangle is called a self-conjugate triangle. 4. The poles and polars of the lines and points of rectilinear plane figures with respect to a coplanar conic form a rectilinear figure called the polar reciprocal of the given figure with respect to the auxiliary conic. The method of reciprocal polars obtains from any given theorem concerning the positions of points and lines another theorem in which straight lines take the place of points and points of straight lines. (See DUALITY.) Thus, a line joining two points in one figure corresponds to a point determined by two intersecting lines in the reciprocal figure. Since the pole of any line through the centre of the auxiliary conic is at infinity, the points at infinity on the reciprocal curve correspond to the tangents to the original curve from the centre of the auxiliary conic. Hence the reciprocal of a conic is a hyperbola, parabola, or ellipse, according as the tangents to it through the centre of the auxiliary conic are real, coincident, or imaginary. Pascal's and Brianchon's theorems are reciprocals (See CONCURRENCE AND COLLINEARITY.) Conjugate lines or conjugate points project into conjugate lines or conjugate points (see PROJECTION), hence the relations of pole and polar are unaltered by projection.

The relations between pole and polar were known to the ancients, but Desargues (1639) was the first to develop the theory. To Servois (1810) is due the name "pole" (in this sense), and to Gergonne (1812) the name "polar." Steiner (1848) also treated the subject exhaustively. Hesse (1837, 1842) introduced the notion of polar triangles, polar tetrahedrons, and systems of conjugate points as the geometric expressions of analytic relations.

The terms "pole" and "polar" have other meanings in mathematics than those already mentioned. The centre from which radii vectores are drawn in a system of polar coordinates (see COORDINATES) is called the pole. The extremities of the diameter of a sphere, perpendicular to one of its circles, are called poles of the circle. If the sides of a spherical triangle are arcs of circles whose poles are the vertices of another triangle, the latter is called the polar triangle of the first. It is shown in geometry that if one triangle is the polar of another, the second is a polar of the first. Consult: for the bibliography of the subject of polars of various orders, Joa-

chimisthal, in *Nouvelles Annales de Mathématiques* (Paris, 1850); for the theory of the subject, Salmon, *Higher Plane Curves* (Dublin, 1852); Reye, *Geometrie der Lage* (2d ed., Leipzig, 1882-86; Eng. ed., New York, 1898); also: Gibson and Pinkerton, *Elements of Analytical Geometry* (New York, 1911); Smith and Gale, *New Analytic Geometry* (Boston, 1912); George Salmon, *Treatise on the Analytic Geometry of Three Dimensions* (5th ed., 2 vols., New York, 1912-15); Dowling and Turneure, *Analytic Geometry* (ib., 1914).

POLE'BURN'. A disease of tobacco (q.v.).

POLE'CAT' (probably from Fr. *poule*, hen + Eng. *cat*; hardly from *Pole* + *cat* or from OF. *pulent*, stinking + Eng. *cat*), or FITCHET. The largest of European martens (*Putorius fectidus*, or more correctly *Mustela putorius putorius*), the length of the head and body being about 18 inches, the length of the tail more than 5 inches, and the form stouter than that of the weasel. Its color is a deep blackish brown; the head, tail, and feet almost black, the under parts yellowish, the ears edged with white, and a whitish space around the muzzle. The hair is of two kinds—a short, woolly fur, which is pale yellow or somewhat tawny, and long, shining, darker hairs. (See Plate of FUR-BEARING ANIMALS.) There is a pouch or follicle under the tail, which exudes a yellowish, creamish substance with a fetid odor; and this odor is particularly strong when the animal is irritated or alarmed. Hence its name fouchart (foul marten), which, with various provincial modifications, is prevalent in most parts of Great Britain.

The polecat was much more common in Great Britain in former times than now, and is almost extirpated from some districts through the constant war waged against it. It eats everything that the gamekeeper wishes to preserve and is extremely destructive in the poultry yard. The ferret, however, is only a semidomesticated race of this species, its natural energies controlled for the pursuit of vermin. The skin of the polecat is used as a fur under the name of fitch, and is similar but inferior to that of the marten. The long hairs, pulled out by the furrier, are utilized for making artists' brushes.

The polecat of North America is the skunk, and that of South Africa is a badger (q.v.).

POLE FLOUNDER. An elongated species of flounder (q.v.), called in Great Britain craig fluke, which is found in rather deep water on both coasts of the Atlantic as far south as France and Cape Cod. It is occasionally taken in great numbers in beam trawls off the coast of New England, and is highly valued as delicate food, perhaps equal to the sole. Its Linnæan name is *Glyptocephalus cynoglossus*. A nearly related species on the Pacific coast is small, thin, and unappetizing.

POLE'EMON (Lat., from Gk. Πόλεμων) A Greek geographer of the second century B.C., surnamed the Periegete. He was born in the district of Troas, but afterward removed to Athens, where he obtained citizenship about 200 B.C. After traveling through Greece he wrote several geographical works, which were almost the first to contain special references to inscriptions, dedications, famous paintings, and public monuments of all kinds. His works are frequently quoted by later writers, including Athenæus and Pausanias. The few extant fragments have been collected by Müller in his *Fragmenta Historicorum Græcorum* (Paris, 1841) and by Preller

(Leipzig, 1838). Consult H. F. Tozer, *A History of Ancient Geography* (Cambridge, 1897), and Christ-Schmid, *Geschichte der griechischen Literatur*, vol. ii, part i (5th ed., Munich, 1911).

POL'EMONIA'CEÆ (Neo-Lat. nom. pl., from Gk. πολεμώνιον, *polemōnion*, a plant, probably valerian, or perhaps named in honor of the Athenian philosopher Polemon or of a king of Pontus of the same name, popularly derived from πόλεμος, *polemos*, war, being alleged to have been the cause of war between two kings), **THE POLEMONIUM FAMILY.** A family of herbaceous dicotyledons containing more than 200 species in about 20 genera and most abundant in western North America. The most familiar genus is *Phlœa*, with about 40 species, many of which are cultivated for their ornamental flowers. The largest genus is *Gilia*, with about 100 species, all of them natives of North America and most of them in western North America. The genus which gives name to the family is *Polemonium*, with about 15 species, one of which is the Greek valerian or bluebell (*P. reptans*). Another conspicuous western genus is *Collomia*, with about 15 species.

POLESIANS, pò-lě'shanz. A brachycephalic people between White and Little Russia, bounded on the north by Grodno and Minsk, on the south by Volhynia, and on the west by Poland. They are isolated in the marshes of Pinsk and along the swamps of the Pripet River and have a cephalic index of 85. The Polesians are supposed to have an infusion of Polish blood, which accounts for their broad heads.

POLE'STAR, or POLARIS. The nearest conspicuous star to the north pole of the heavens. The second-magnitude star which at present goes under the name of polestar is the star α in the constellation of Ursa Minor. By examining attentively the movements of the stars throughout a clear night we observe that they describe circles which are largest for stars near the celestial equator and become smaller and smaller as we approach a certain point (the north pole), close to which is the star above mentioned. The polestar is, however, a little less than $1\frac{1}{2}^\circ$ from the pole, and has a small but perceptible motion around it. (See POLE.) Owing to the motion of the pole of the heavens around the pole of the ecliptic (see PRECESSION), this star will in course of time (about 2100) approach to within 28' from the north pole and will then recede from it. At the time of Hipparchus (156 B.C.) it was 12° and, in 1785, 2° from the north pole. Its place can easily be found in the heavens, for a line drawn between the stars α and β (called the two pointers, from this peculiarity) of the constellation Ursa Major, or the Great Bear, and produced northward for about $4\frac{1}{2}$ times its own length, will almost touch the polestar. Two thousand years ago the star β of Ursa Minor was the polestar; and about 2300 years before the Christian era the star α in the constellation of the Dragon was not more than $10'$ from the north pole, and about 12,000 years from now the bright star Vega in Lyra will be within 5° of it.

The south pole of the heavens is not similarly marked by the neighborhood of a bright star, though there is a small telescopic star very close to it.

POLE VAULTING. See FIELD SPORTS, and Plate of ATHLETICS.

POLHEM, pól'hém, CHRISTOPHER (1661-1751). A Swedish engineer and inventor, called the

Father of Swedish Mechanics. He was born at Visby and studied at Upsala. His invention of an ore-hoisting mechanism caused the King to appoint him director of mine mechanics. During travels in England, Holland, France, and Germany (1694-97) he studied the progress of inventions in those countries. Subsequently he devised many machines for use in transportation, agriculture, mining, and manufacturing. He built docks also, and Charles XII appointed him to construct a canal between the Baltic Sea and Cattegat. For George I of Hanover and England he invented a minting machine to be used at Kassel, and directed improvements in mining methods. Czar Peter I of Russia also sought his services; but most of his work was done for his fatherland. Polhem was knighted by the Swedish King.

POLICE, *pó-lēs'* (from Lat. *politia*, from Gk. *πολιτεία*, *politeia*, government, citizenship, from *πολίτης*, *politēs*, citizen, from *πόλις*, *polis*, city). In its broader significance, the whole internal administration of a state less the judicial power. In a more restricted sense the term "police" denotes that sphere of governmental activity which has to do with the maintenance of the public peace, order, and security, and the protection of the public health and morals. (See **POLICE POWER**.) In this article the use of the term is still further restricted to that part of the state administration which is concerned primarily with the preservation of the peace and the prevention and detection of crime in urban communities. The first instance of the separation of the police magistracy from the judicial magistracy seems to have occurred in France in the fourteenth century. About the same time a military police was organized which eventually became the basis of the present French *gendarmérie*. In Paris a systematic police force soon came to be organized and before the close of the eighteenth century consisted of between 700 and 800 men. In England the police administration was in the hands of the justices of the peace, who had under their control a small number of parish constables. During the eighteenth century several attempts were made to improve the system of London police, but it was not until 1828 that the passage of the celebrated Peel Act established a constabulary force for the city under commissioners appointed by the crown. This has been described as the first modern police force in the world. The act provided for a thoroughly organized and disciplined corps of trained men, a regular day and night patrol, and a force of reserves to be stationed at police headquarters. Although bitterly attacked at the time, the Peel system in its main features was adopted in other cities in England. In New York City, in 1841, the police force consisted of two constables in each of the 17 wards, 100 marshals, 300 night watchmen, 100 wardens, bell ringers, inspectors, and so on. At the same time Boston had 22 day policemen and 200 night watchmen; Philadelphia had 24 day patrolmen and 120 night watchmen. During the first half of the century the control of the police was everywhere in the hands of the local authorities, but beginning with the year 1857 State boards of police commissioners were created for the management of the police in several of the larger cities.

The system of organization of the police force varies widely with different cities. The supreme authority is usually either a single superintendent

ent or a board. In continental Europe the single-headed authority is most common, the *maire* or the *burgomaster* being commonly vested with the immediate control of police affairs. In the United States the same system prevails in most of the smaller cities and in many of the larger ones. In Great Britain the statutes usually require that such boards shall be bipartisan, chiefly on account of the control which the police exercise over the machinery of elections. The superintendent, commissioner, or chief, whatever title he may bear, is the executive head of the police administration and in general is responsible for the character of the police service. For the purposes of police administration a city is usually divided into a number of police districts or precincts. Each precinct has a detachment of police, at the head of which is a captain, who is responsible for the execution of the orders of the chief, and who in turn may issue instructions to those under his command. In the larger cities officers intermediate between captains and superintendents, called inspectors, are frequently provided, and these have control of a certain number of precincts. Next below the captains in the organization are the lieutenants, or, more frequently, the sergeants. Below the sergeants are the roundsmen, who are charged with the duty of seeing that the patrolmen perform their duties. The lowest officer of the police force is the patrolman, whose general duty it is to patrol a given district of territory. In addition to the patrolmen on active duty a number of reserves are usually kept at each station for use in case of emergency. Frequently, as in the public parks and in parts of the city where the posts are unusually long, mounted police are provided, and in the principal ports, as in the case of New York City, there are special harbor police. A frequent and important branch of the police service is the detective bureau, consisting of a force of men employed for their shrewdness and ability to detect crime as well as their knowledge of noted criminals. Unlike the regular patrolmen, they do not wear uniforms. Occasionally, as in the city of New York, there are also special detachments of sanitary police and bicycle squads.

From the standpoint of the relation of the police to the central government considerable variety in principle is to be seen. Thus, in Ireland, Egypt, India, and Australia the police is subject to the strict control of the central government. In Ireland the police force is the Irish constabulary, organized in 1836, consisting of military forces under the immediate control of the central government at Dublin. In Russia the system is thoroughly centralized. Elsewhere in continental Europe the police administration is either directly or indirectly under central control. It is a general practice in Europe for the central government to defray a part of the cost of administering the police. In Berlin the amount granted by the central government is four-fifths of the cost; in London and Paris, one-third. The borough and county police of England receive a parliamentary grant, amounting to one-half of the cost of maintenance, provided a given standard of efficiency is maintained. In American cities the entire cost of its police is defrayed by the municipal government.

In most of the European countries a state police is maintained and is under the immediate control of the central government. It is gen-

erally modeled after the French *gendarmerie*, which is a part of the regular army. In Russia the secret police is largely concerned with the suppression of political agitation. Although locally selected, police officers in the United States are regarded by the courts as State agents and not agents of the municipalities, and the municipalities cannot be held liable for the tortious acts of its police officers.

Bibliography. E. H. Savage, *A Chronological History of the Boston Watch and Police* (2d ed., Boston, 1865); A. E. Costello, *Our Police Protectors: History of the New York Police from the Earliest Period* (2d ed., New York, 1885); Félix Brayer, *Dictionnaire général de police, administrative et judiciaire* (2d ed., 4 vols., Paris, 1886-90); H. O. Sprogle, *Philadelphia Police, Past and Present* (Philadelphia, 1887); J. A. Fairlie, *Municipal Administration* (New York, 1901); Robert von Hippel, *Handbuch der Polizei Verwaltung* (Berlin, 1905); L. F. Fuld, *Police Administration* (New York, 1909); R. B. Fosdick, *European Police Systems* (ib., 1915).

POLICE, MILITARY. See MILITARY POLICE.

POLICE COURT. An inferior court of criminal jurisdiction, usually established in a borough, city, or large town by legislative authority, for taking the statements of persons arrested for crime and for the summary disposition of petty offenses. The judge of a police court usually has the powers of an examining and committing magistrate. In the United States such courts are often known as magistrates' courts or municipal or justices' courts. See COURT; JUSTICE OF THE PEACE; MAGISTRATE.

POLICE MAGISTRATE. See MAGISTRATE.

POLICE MATRONS. Women who have charge of women and children in police stations, jails, and other places where they are detained. Elizabeth Fry (q.v.) first called attention to the deplorable condition of women in prisons and insisted upon the principle that none but women should be employed in the superintendence of women. The Society for the Improvement of Prison Discipline demanded police matrons in 1823, and the National Prison Congress cited their appointment as a requirement of prison reform in 1886. The impropriety of allowing men to search women and to care for their physical wants has only recently been recognized in the United States. The reform has been instituted entirely by women, usually Woman's Christian Temperance Union workers. In Portland (Me.) and Indianapolis associations of women provided for police matrons at their own expense before the office was established by law. Portland (Me.) first established the position of police matron in 1876. Chicago, Baltimore, Cincinnati, and Philadelphia employed them at a later date. They are now required for the larger cities in a number of States. The movement has made marked advance since 1890.

POLICE POWER. The inherent power of a government to take such action and to pass such laws as may be deemed necessary for its own protection and to secure the safety, comfort, and general welfare of its citizens. It is difficult to define the precise limits of the police power of a government, and probably there are no absolute limits except that it shall only be exercised for the purposes above mentioned and under such restrictions as may be imposed by a fundamental law or constitution. Chief Justice Shaw of Massachusetts defined it as "the power vested in the Legislature by the Constitu-

tion to make, ordain, and establish all manner of wholesome and reasonable laws, statutes, and ordinances, either with penalties or without, not repugnant to the Constitution, as they shall judge to be for the good and welfare of the commonwealth and of the subjects of the same." While governments have always assumed to exercise the powers above mentioned, the law and theory of the police power as a justification and authority for otherwise arbitrary and despotic acts have been a growth of the nineteenth century in the United States. In some respects the police power is more arbitrary than that of eminent domain. By virtue of the latter a government may take private property only upon making proper compensation therefor, whereas if property is confiscated or destroyed for the public good under the police power no reimbursement need be made to the owner. This distinction exists in practice even in England, where the police power may be exercised by Parliament without the constitutional restrictions by which it is limited in the United States. It is only in this country and to a lesser extent in the self-governing colonies of Great Britain that the judicial definitions of the police power constitute a part of the law of the Constitution.

In the United States the police power of the national government rests upon the general and specific grants of authority vested by the Constitution in the several departments of the government, especially in the Congress. The more general grants of power, as the power of Congress to provide for the general welfare of the United States, are restricted by various provisions drawn from the English Bill of Rights (q.v.) or from the political experience of the English and American peoples. In the several States, on the other hand, the police power rests upon the general legislative authority, which is unlimited except as restrained by express provisions contained in the Federal Constitution or in that of the State whose power is in question.

As the police power of the national government and of the several States lies between these limits of general governmental authority and specific constitutional restrictions, it follows that the law of the subject rests upon the legislation in which the scope and meaning of the restrictive provisions have been tested and on the judicial decisions of the Federal and State courts in which they have been examined and defined. There can evidently be no law of the police power in a country like England, where the governmental, and especially the legislative, authority is entirely unrestrained by a fundamental law.

As above defined, the police power is practically identical with governmental power. In recent practice, however, the term has come to be restricted to a limited area of the power of government, and especially to the following classes of cases: (1) legislation designed to promote the social welfare, i.e., the public health, public morals, public safety, and public order and comfort; (2) legislation designed to promote the economic interests of the community, as in the protection against fraud, protection against oppression, and the like; and (3) administrative measures designed to secure these ends.

Among the numerous laws and regulations of the various States which have been held to be within the legitimate exercise of the police power are acts requiring railways to fence in their tracks; requiring signboards at crossings; regu-

lating the speed of trains; regulating the charges of persons in quasi-public occupations, as warehousemen, cab drivers, ferry owners, etc.; regulating the storage of explosives and the sale of poisons and of liquor; prohibiting the adulteration of foods; regulating the hours and conditions of employment of women and children; providing for compensation to employees for injuries sustained in the course of their employment; requiring the quarantine of infectious diseases and the destruction of infected houses and property; and the licensing of physicians, druggists, engineers, etc. Laws prohibiting labor and enforcing quiet on Sunday have been held not to encroach on the religious liberty of individuals, but to be a valid exercise of the police power for the general welfare of the community. The tendency of recent decisions in the State as well as in the Federal courts has been to give an enlarged construction to the police power, whether exercised by Congress or by State Legislatures, and where the courts have, as in some recent instances, retarded this process, it has been aided by constitutional amendment.

Bibliography. W. P. Prentice, *Police Powers* (New York, 1894); T. M. Cooley, *Treatise on the Constitutional Limitations which Rest upon the Legislative Power of the States of the American Union* (7th ed., Boston, 1903); Ernst Freund, *The Police Power, Public Policy, and Constitutional Right* (Chicago, 1904); William McAdoo, *Guarding a Great City* (New York, 1906); Brand Whitlock, *On the Enforcement of Law in Cities* (2d ed., Indianapolis, 1913); H. W. Laidler, *Boycotts and the Labor Struggle* (New York, 1914); C. F. Cahalane, *Police Practice and Procedure* (ib., 1915).

POLICY (Fr. *police*, It. *polizza*, from ML. *politicum*, *poletum*, *poleticum*, *polyptycum*, register, from Gk. *πολύπτυχον*, neut. sing. of *πολύπτυχος*, *polyptychos*, having many folds or leaves, from *πολύς*, *polys*, much, many + *πτύξ*, *ptyx*, fold, leaf, from *πτύσσειν*, *ptyssein*, to fold). 1. A method of gambling resembling the ordinary lottery in that slips, on which are printed numbers and usually some name or device for identification, are given out to the players and corresponding numbers on slips are intermingled in some receptacle and drawn out by a blindfolded person. The players usually make bets upon the order in which numbers in a certain sequence will appear. Although the odds given the players are very alluring, the chances of winning are actually very much against them. Usually very small bets will be received, and for this reason this method of gambling has spread among the poorer classes, especially in the larger cities. Gambling of this form is prohibited in nearly all of the United States, either under the specific name of policy or under the more general term of lottery. The United States postal laws prohibit the mailing of advertisements or tickets of policy shops, and for this reason most establishments of this sort operate in a limited locality and with some attempts at secrecy. See GAMBLING; LOTTERY.

2. The written contract by which a person undertakes to insure another against the happening of any event, or to pay him a certain sum upon a certain contingency, is called a policy. The policy is frequently designated by some qualifying word, as "tontine," "endowment," or the like, according to the nature of the insurance undertaken. See INSURANCE.

POLIDORO (CALDARA) DA CARAVAGGIO, pò'lè-dò'rò dà kà'rà-và'jò (c.1495-1543). An Italian painter and decorator of the High Renaissance. His real name was Caldara and he was born at Caravaggio, near Milan. Coming to Rome as a youth, he obtained employment as a mason upon the Vatican constructions in progress under the direction of Raphael. He received instruction in painting from Maturino, a Florentine, in conjunction with whom he executed a great number of decorations in *sggraffito* (q.v.) upon the façades of Roman palaces, which have mostly perished, but which are well known from engravings. The sack of Rome in 1527 and the death of Maturino drove Polidoro to Naples, where he developed a realistic but florid and coarse style, which exercised great influence on the character of the Neapolitan school. The picture most typical of his last phase of his art is "Christ Bearing the Cross" (1534), in the Museum of Naples. He afterward went to Messina and acquired high standing and wealth, but was assassinated there in 1543. Consult Bertolotti, *Artisti lombardi a Roma* (Milan, 1881).

POLIESSIE, pò-lyé'syé (Russ., wooded region). A marshy region in the west of Russia, comprising the larger part of the Government of Minsk, the northern part of Volhynia, the eastern part of Grodno, as well as portions of the governments of Mohilev and Kiev. It is thickly wooded and is noted for its unhealthy climate. A considerable area has been drained by the government since 1873, and the reclaimed regions yield good crops of hay.

POLIGNAC, pò'lè'nyák'. An ancient French family, several of whose members played a prominent part at court after the time of Louis XIV.—MELCHIOR DE POLIGNAC (1661-1742) was born at Puy-en-Velay in the Department of Haute-Loire. He was destined by his parents for an ecclesiastical career and received an excellent education. In 1693 he was sent to Poland as Ambassador, and intrigued so successfully in favor of the Prince de Conti (q.v.) that the latter was actually elected John Sobieski's (q.v.) successor in 1697. Augustus the Strong, however, proved the successful aspirant to the throne, and both Conti and Polignac had to leave Poland, in consequence of which the latter retired to his abbey at Bonport. In 1702 he was recalled to Versailles, and rose higher than ever in the royal favor. In 1712 he was appointed French Plenipotentiary at the Congress of Utrecht, and after his return obtained the abbeys of Corbie and Anchin. During the regency Polignac took part in the conspiracy of Cellamare and was banished to his abbey of Anchin. In 1725 he was sent to Rome, charged with the conduct of French affairs, and signalized his mission by healing the quarrel that was dividing the Gallican church on the subject of the famous bull *Unigenitus*. (See JANSENISM.) In 1725 the King raised him to the archbishopric of Auch, and on his return to France he spent the remainder of his days in retirement. Polignac succeeded Bossuet at the Académie Française in 1704, and was also a member of the Académie des Sciences and of the Académie des Belles-Lettres.

The other members of the Polignac family who deserve mention are connected with the last phases of the Bourbon monarchy in France. In the reign of Louis XVI Yolande Martine Gabrielle de Polastron, Duchess de Polignac (1749-

93), and her husband, Jules, Duke de Polignac (died 1817), were among the most intimate and favored advisers of Marie Antoinette. They obtained vast sums of the public money from their connection with the court, and were largely if not mainly responsible for the extravagance which marked the eve of the Revolution. The Polignacs, knowing the deep hatred felt towards them by the French people, were the first of the noblesse to emigrate (July 16, 1789). From the Empress Catharine II of Russia, the duke received an estate in the Ukraine, and did not return to France at the Restoration. He left three sons, of whom only one deserves notice—JULES AUGUSTE ARMAND MARIE, Prince de Polignac, born at Versailles, May 14, 1780. In 1804 he entered with his brother into a conspiracy against Napoleon, and both were imprisoned, but escaped when the allies entered France in 1814. After his return to Paris Polignac became intimate with the Count d'Artois, afterward Charles X, showed an ardent attachment to the Roman Catholic church, and in consequence received from the Pope, in 1820, the title of a Roman prince. The King appointed him Ambassador at the English court in 1823, and finally, in 1829, he became head of the last Bourbon ministry, in which capacity he promulgated the fatal ordinances of July, 1830, that called France to arms and drove Charles X from the throne. (See JULY REVOLUTION.) He then attempted to flee the country, but was captured at Granville, tried, and condemned to imprisonment for life in the fortress of Ham, but was afterward set at liberty by the amnesty of Nov. 29, 1836. During his captivity he wrote *Considérations politiques*. He later took up his residence in England. He died at Saint-Germain, March 2, 1847.

Consult, for Melchior de Polignac, Faucher, *M. de Polignac* (Paris, 1777), for Jules de Polignac and Yolande de Polastron, W. Schléssinger, *Les femmes du XVIII^e siècle: La duchesse de Polignac et son temps* (ib., 1889).

POLILLO, pō-lē'lyō A group of islands in the Philippines, lying about 30 miles east of the Province of Infanta, Luzon, and connected for administrative purposes with the Province of Tayabas (Map: Philippine Islands, D 3). The area of the group is 421 square miles and that of the chief island (Polillo) is 333 square miles. The latter had in 1903 a population of 2224, nearly all of it in the town bearing the name of the island.

POLIOMYELITIS, pōl'i-ō-mī'ē-lī'tīs (med. term, from Gk. *πολιός*, *polios*, gray + *μυελός*, *myelos*, marrow + *-itis*), INFANTILE SPINAL PARALYSIS. An inflammation of the gray matter of the spinal cord. (See NERVOUS SYSTEM AND BRAIN.) Acute anterior poliomyelitis is an inflammation of the anterior horns of the spinal cord, rarely found in adults, but oftener in children, and followed by a flaccid paralysis, later by atrophy of one or more muscular groups. When occurring in children it is known also as infantile paralysis.

History. Attention was called to this disease first by an epidemic of it in Norway in 1868 and again by one in Sweden in 1905. Since then epidemics have appeared in Europe as well as in North and South America (United States, Canada, and Brazil). The disease seems to be universal, and medical research has been called upon to eradicate the malady and to educate the physician to diagnose and treat it correctly.

To this movement the increasing number of reported cases may be attributed rather than to a general spread of poliomyelitis. The Rockefeller Institute in New York has led the medical profession in the study of this disease, with these investigators: Simon Flexner, Lewis, Noguchi, and Amoss. Other important names are: Von Behring, Popper, Levaditi, Kling, Wernstedt, Petterson, Römer, and Pierson.

Etiology. It is only since 1909 that we have known that acute anterior poliomyelitis is an infectious disease. It has been found that the virus belongs to the class of filterable organisms, but up to the present it has not been rendered certainly visible. The virus has been demonstrated in the spinal cord, bulb, brain, spleen, bone marrow, blood, and cerebrospinal fluid, and also in the mucous membrane of the nasopharynx and its secretion, in dust, on handkerchiefs, etc. The mode of entrance into the human body is still under discussion. As the disease can be produced in the monkey (from man or from monkey), guinea pig, rabbit, and dog, the suspicion has gained ground that it could be transferred from a domestic animal to man by blood-sucking insects or by nasal and oral secretion. Bedside observations seem to support this idea, especially in the case of the epidemic among the Indians of Central Alaska, near the Yukon River, in 1913. Laboratory experiments do not corroborate this view. The great difficulty of infecting monkeys by direct introduction of the virus into the blood seems to have brought about a change of opinion. The infection, even from very large doses of virus injected directly into the blood circulation, is much delayed. The virus is promptly deposited in the spleen and bone marrow, but not in the kidneys, spinal cord, or brain. It is not taken up from the blood by the spinal cord and brain until the choroid plexus and the walls of the blood vessels have suffered injury. Infection is quickly produced by direct introduction of the virus into the brain, subarachnoid spaces, or peripheral nerves. The accepted theory, therefore, seems to be that the poliomyelitic virus enters the body through the upper respiratory passages, especially through the nasopharyngeal tissues, whence it may pass through the lymphatic channels surrounding the filaments of the olfactory nerve to the leptomeninges, and thus reaches the cerebrospinal fluid. Finally, experiments to produce poliomyelitis through transmission of the virus by bloodsucking insects have not so far been successful.

Attack. The prodromal stage of the attack varies from 1 to 10 days. The attack usually begins with a coryza, followed by bronchitis and gastrointestinal disturbances, sometimes with fever and a profuse perspiration, with severe pains in the limbs, leaving a paralysis which may, especially with proper attention, in the most favorable cases, be somewhat relieved, after perhaps years of treatment; but in other cases the paralysis will be followed by atrophy and retarded growth of the limb. Death occurs from paralysis of the muscles of respiration or of the alimentary canal.

Treatment. The patient is kept quietly in bed for a considerable time, but careful movement of the affected limb is soon instituted; the treatment proper consists of lumbar puncture, withdrawal of the cerebrospinal fluid, and injection of virus serum in smaller quantity than the amount of fluid withdrawn. The after treat-

ment consists of fresh air, electricity, massage, exercise, correction of muscle action, etc.

Prophylaxis. Prophylaxis must pay special attention to cleanliness and disinfection by nasal and mouth and throat sprays, destruction of secretion, and isolation.

Epidemic. As to the occurrence of an epidemic of poliomyelitis, the reports from physicians and health boards come nearly all to the same conclusion. An infection that may have been latent for years flares up suddenly, independent of weather conditions, without discoverable specific cause, attacking about one in 1500 of the population, mostly children.

Statistics. Thirty-two States require that the health authorities be notified of cases of infantile paralysis.

DEATHS FROM POLIOMYELITIS WITHIN THE
REGISTRATION AREA IN THE UNITED
STATES

YEAR	Number of deaths	Death rate for 100,000 inhabitants
1909	569	1.1
1910	1459	2.7
1911	1060	1.8
1912	1136	1.9

Of the 1136 deaths in 1912 there were 737 of children under 5 years, 164 of children between 5 and 9 years, 71 of children between 10 and 14 years, 43 of patients between 15 and 20 years, and 121 of patients over 20. In 1909 were reported 2500 cases with 569 deaths and, in 1910, 7095 cases with 1459 deaths. The mortality from infantile paralysis is variously stated. Krause, of Germany, gives the following percentages for 1911: New York, 5; Norway, 14.56; Sweden, 16.7; Austria, 22.3. Potpeschnigg, of Austria, found in 1909 in Styria (in a population of about 1,750,000) 600 cases of infantile paralysis, with a mortality of 7.51 per cent of children under 14 years and 24.25 per cent of patients over 14. In Pennsylvania were reported, in 1911, 773 cases—437 males (2 colored), 336 females (1 colored). Forty-four cases developed in families where another member had been first attacked; 18.4 per cent (142 patients) recovered without paralysis; 71.6 per cent (294) suffered from after effects. Hold, in 1911, observed 300 children under 3 years, and found that 70 per cent of the patients, apart from an epidemic, were tuberculous.

The acute form in adults runs much the same course, but the cases are more severe and more often end fatally. Chronic anterior poliomyelitis is found mostly in adults, very rarely in children. It shows a slowly developing atrophy, with long periods of quiescence and even apparent improvement. Treatment is the same as in infantile paralysis—electricity, massage, exercise, carefully and properly applied. But the prognosis is not so good, and death usually takes place from atrophy of the muscles of respiration. Consult: Peabody, Draper, and Dochez, *Monograph No. 4, Rockefeller Institute for Medical Research* (New York, 1912); Flexner, Clark, and Amoss, *A Contribution to the Pathology of Epidemic Poliomyelitis* (ib., 1914); Saunders, Meisenbach, and Wisdom, *The Causation and Prevention of Infantile Paralysis* (St. Louis, 1914); Frauenthal and Manning, *A Manual of Infantile Paralysis* (Philadelphia, 1914). See MUSCLE, DISEASES OF.

POLIORCETES, pól'i-ór-sé'téz. See DEMETRIUS I, Macedonian King.

POLISH CATHOLIC CHURCH IN THE UNITED STATES. See INDEPENDENT CATHOLIC CHURCH IN THE UNITED STATES (POLISH).

POLISH FOWL. A variety of poultry traceable as far back as the sixteenth century under many names. These fowls are bred in the United States mainly on account of their handsome plumage, the most striking feature of which is a great globular crest, or topknot, which envelops the entire head. See Colored Plate of FOWLS, accompanying article POULTRY.

POLISHING MATERIALS. See ABRA-SIVES.

POLISH LANGUAGE. A language belonging to the western group of Slavic languages (q.v.) and occupying the second place in importance in that family. It is spoken by about 15,000,000 persons in those parts of Russia, Austro-Hungary, and Prussia which constituted the former Kingdom of Poland and by more than 1,000,000 persons in America. Of the many Polish dialects the following are the most important: Great Polish, in Posen and in portions of the governments of Kalisz and Plock; Little Polish—the most euphonic—in Galicia (Cracow and Lemberg being the centres); Masurian, or Masovian—in East Prussia and in the north-eastern part of the Polish Kingdom (Warsaw the centre); Lithuanian Polish, used by Mickiewicz and other writers; Prussian and Silesian Polish—full of Germanisms. The Kashubian and Slovincian, although sufficiently distinct from Polish proper, are sometimes considered as dialectal varieties of that language. The earliest literary monuments in Polish do not go further back than the fourteenth century. In its historical developments the Polish language underwent many outside influences. The introduction of Christianity (c.965) brought Latin to the front at the expense of the native tongue, while the numerous German settlers introduced German words for articles of everyday life. The Reformation brought the language of the country into Church use. For about two centuries the macaronic literature (a mixture of Latin and Polish) prevailed. The pseudo-classical period brought the mania for everything French and with it the adoption of numerous Gallicisms. It was reserved for the Romantics to purify the Polish language; and their traditions are still kept up by many purists in a struggle against the inroads of Russian technical terms and of Germanisms.

Although the combinations of sibilants in Polish look formidable on paper, they are soft in pronunciation: *sz* = *sh*, *cz* = *ch*, *rz* = *zh*, or *sh* after consonants. Besides the phonologic characteristics mentioned in the article SLAVIC LANGUAGES the following features of the Polish language may be mentioned: 1. Seven cases in nouns—nominative, genitive, dative, accusative, vocative, instrumental (ablative), and locative (prepositional). 2. Loss of the dual (in nouns and verbs), of which traces are still to be found, however, in various dialects. 3. All futures are compound; the simple preterites have all been lost, and periphrastic forms now take their place. 4. Invariable accentuation on the penult, which is a later substitution for the original Slavic free accent. In power and variety of expression the Polish language fairly rivals Russian.

Bibliography. **DICTIONARIES.** In Polish:

Linde, *Dictionary of the Polish Language* (8 vols., 2d ed., Lemberg, 1854-60); *Dictionary of the Polish Language*, edited by seven Polish scholars (2 vols., Vilna, 1856-61), fuller than the preceding but not so scientific; and the great dictionary of Karłowicz, Kryński, and Niedzwiedzki, published at Warsaw (1900-). In other languages: A. E. B. Chodzko, *Complete English-Polish and Polish-English Dictionary*; Friedrich Boock-Arkossy, *Neues Vollständiges polnisch-deutsches und deutsch-polnisches Wörterbuch* (6th ed., 2 vols., Leipzig, 1893); id., *Polnisch-deutsches und deutsch-polnisches Wörterbuch* (8th ed., ib., 1899); Kierst and Callier, *Pocket Dictionary of English and Polish* (2d ed., ib., 1906).

GRAMMARS. In Polish: Malecki, *Grammar of the Polish Language* (Lemberg, 1863), excellent; id., *Comparative Historical Grammar of the Polish Language* (ib., 1879), superseded by that of Kryński (3d ed., Warsaw, 1903); id., *Grammar of the Polish Language, Briefer Course* (ib., 6th ed., 1882); Malinowski, *Comparative Critical Grammar of the Polish Language* (Posen, 1870; and supplement, 1873); Kalina, *Grammatical Forms of the Polish Language to the End of the Eighteenth Century* (Lemberg, 1883, unfinished), most valuable. In Russian: Baudouin de Courtenay, *The Old Polish Language* (Leipzig, 1870). In other languages: Smith, *Polnische Grammatik* (2d ed., Berlin, 1863); W. R. Morfill, *A Simplified Grammar of the Polish Language* (London, 1884); Vymazal, *Grammatik der polnischen Sprache zunächst zum Selbstunterricht* (Brünn, 1884); Poplinski, *Elementarbuch der polnischen Sprache* (14th ed., Leipzig, 1893); Asmus Soerensen, *Polnische Grammatik* (ib., 1900).

POLISH LITERATURE. The "popular" literature of the Poles falls into two main divisions: (1) lyric and (2) epic. The first, although expressing the sadness of the race, oftener treats of themes of boundless merriment and the joy of life. The second group consists of tales, animal epics, apologues, religious legends, and finally a few historical tales. The moods are definite and calm, strong realism intermingled with humor being the rule. These are embodied in numerous adages, proverbs, and sayings—the whole philosophy of the nation. The best collections of material on this popular literature are *Adalberg's Book of Polish Proverbs* (Warsaw, 1894) and the monumental work of Oskar Kolberg, *The People: Its Customs, Manners, Language, Traditions, Proverbs, Usages, etc.* (Warsaw, 1865-98), of which 23 volumes have so far appeared.

Written Literature. Earliest Times. With Christianity (c.965) came also the rejection of everything national as reminiscent of heathenism. The indigenous letters were replaced by the Latin alphabet, and all studies in the schools had for their sole object the mastery of the Latin language. In the thirteenth century education was extended, and more than 120 different schools are known to have existed in the period of 1215-1364. But the Polish scholars writing in Latin are in no way representative of the Polish nation.

The literary remains of this period to the end of the fifteenth century fall into three groups: (a) *Scientific.* Annals and Chronicles of Martin Gallus (1110-35), quite fantastic in subject matter, but unaffected in style and humorous; Wikenty Kadlubek (1160-1223), in most arti-

ficial and labored mediæval Latin; the journeys of the Franciscan Carpini (Giovanni di Piano) and Benedict Polacus to the Tatar Khan Hayuk in the thirteenth century. The *Historia Poloniæ* of Jan Długosz (1415-80), Bishop of Lemberg, in 12 volumes, is a remarkable result of more than two decades of independent research, and is animated by strong patriotism and written in artistic style. (b) *Didactic.* Sermons, though delivered in Polish, were written in Latin, to give them a wider circulation abroad. They contain much anecdotic material, important for the history of literature, as well as accounts of current superstitions and ethical instruction valuable for the history of Polish morals. (c) *Poetic.* These are very few; most of the extant manuscripts contain mediæval translations of the classics. Of the Polish poems preserved in Gallus, Wikenty, and Długosz, many are poetic in spirit and feeling, though crude in form. Of these the earliest and most remarkable specimen is the famous "Battle Hymn to the Virgin" (*Bogurodzica*), ascribed by tradition to St. Wojciech (Adalbert) of the tenth century. Other specimens are: the *Psalter of Queen Margaret*, in a manuscript of the fourteenth century, also called *Florian Psalter*; a prayer book of the year 1375; a polish translation of the fiftieth Psalm; the Gnesen sermons; the Bible written for Queen Sophia (1455). Some Polish statutes and religious hymns belong to the fifteenth century.

During this period humanistic ideas gained ground. The number of schools increased rapidly to satisfy the great demand for study among the laity. The contest between scholastics and humanists, raging in other parts of Europe, was carried on also in Poland. Andrzej Halka's *Eulogy of Wiclif* proves that literature was becoming a means of religious propaganda.

In the sixteenth century the Polish language was gradually superseding Latin. The first book in Polish was printed in 1521 (*The Discourse of King Solomon*), and this is commonly taken as the beginning of the new golden period of Polish literature. A Protestant translation of the Bible appeared at Brześć (Brest-Litovsk) in 1553. The great names of this period are: Mikolaj Rej of Naglowice (1505-69), who gives in his poems vivid pictures of contemporary manners, typical studies in character, and fine descriptions of scenery; the fiery and eloquent Catholic Peter Skarga (1536-1612); and Jan Kochanowski (q.v.) (1530-84), best known by his *Psalms*. His *Laments* (on the death of his daughter Ursula) are characterized by depth and sincerity of feeling and perfection of form. His *Jests* are rollicking with fun or bitter with satire. His dramatic effort (*Departure of the Greek Envoy*) was the pioneer in Polish drama. The names most closely allied with his are those of Szarzyński, Grochowski, Peter Kochanowski, Szymonowicz, and Sebastian Klono-wicz (1545-1602), a keen satirist, but not a poet, and Stanislas Orzechowski (1515-66), who perfected the Polish language in his publicist writings.

The only poet of merit that the seventeenth century produced was Maciej Kazimierz Sarbiewski (1595-1640), a writer of Latin poems. The exhaustion of the poetic vein brought about the so-called macaronic period of Polish literature. The only valuable achievements were the increasing number of translations of European poets. A theatre was established by Ladislas IV, where English, French, and Italian actors

appeared. Native mysteries had been presented, such as Rej's *Joseph*. All were very poor, the best being those of Andrzej Morsztyn, but even he was more an imitator of French and Italian models than a creative poet; his translations of Corneille's *Cid* and Tasso's pastoral drama *Aminia*, however, were excellent. Wacław Potocki's *The War of Khotin*, discovered in manuscript in 1850, is a powerful realistic poem, more striking when contrasted with the general barrenness of the period. The first half of the eighteenth century served to emphasize the dangers arising from internal disorders. Martin Matuszewski (1714-65) gave vivid pictures of the moral depravity of the times. Warning voices were heard against the licentiousness of the nobility (Karwicky) and the *liberum veto* (Konarski).

Period of French Pseudoclassicism (1750-1822). The weak King Stanislas Poniatowski was a man of high culture and strong æsthetic leanings. A philosophical reaction succeeded Catholicism, and French ideas triumphed. The consciousness of social evils prompted the writers to expose them in satire and fable, while virtuosity of form was the chief object in this anxiety to imitate the French models. Trembecki (1723-1812), Wengerski (1755-87), and Krasicki (1735-1801) armed themselves against the reigning inertia, barbarous prejudices, and foolish imitation of foreign manners. Bishop Naruszewicz fell below these three in poetic gifts, but, being a historian, surpassed them in breadth of view; his satire was more bitter, he felt more keenly the demoralization of society. Comedy flourished, and the first political comedy in Polish, *The Envoy's Return*, by Niemcewicz, enjoyed great success. The greatest name in pseudoclassical drama is that of Alexander Fredro (1793-1876), who wrote much later, but really belonged to this period. His plays are among the gems of the Polish stage, owing to the beauty and purity of the language, the genuine wit, the live types, and the unflagging interest of the action. Along with this satirical current the sentimentalist movement found strong representatives in Krasicki, Karpiński, and Książnin, the first being especially popular. The final partition of Poland (1795) brought a wave of patriotism. Hence the success of Niemcewicz's *Historical Ballads* (1816). Dramas cropped up in answer to the same demand for and interest in everything historical.

Romanticism (1822-62). Romanticism, which placed feeling above reason, answered the condition of Poland. *The Ode to Youth* of Mickiewicz struck a responsive chord in the hearts of his countrymen. From such feelings proceeded the love for the miraculous (destined to develop into mysticism a little later) and national folklore abounding in it. The educational reforms of Czacki and Czartoryski brought more learning; the poets sought recognition from their people as a whole, and not from personal patrons. The lyceum at Krzemieniec, with its inspired historian Lelewel poetically reproducing the ancient times, turned out a score of students who became the disseminators of romanticism in their poetical and critical works, all of which aimed at creating a national poetry. Among the various factors in this literary movement the so-called Ukrainian (Little Russian) school was the most prominent. Among its representatives Malczewski (1793-1826) was the bard of the nobility; Zaleski (1802-86) glorified free

Cossackdom; Goszczynski (1803-76) sang with epic simplicity the customs and beliefs of the Haidamaks. Zaleski's poems, appearing in 1822, passed unnoticed. A few months later another collection of poems appeared, and from these the period of romanticism was dated. They were by Adam Mickiewicz (q.v.) (1798-1855), the greatest name in Polish literature. They exposed the author to attack from the adherents of pseudoclassicism, but soon these were either turned into romantics or were silenced. Before long the opposition to the romantic movement resulted in the exile of Mickiewicz and others, and almost all the poets then emigrated. Closely allied with Mickiewicz were poets of nearly equal power, as Krasinski (q.v.), who began with universal ideals (in his *Undivine Comedy*) and then narrowed down to pure nationalism (in *Irydion*, *Dawn*, and *Psalm of the Future*). Unlike him Slowacki had a definite purpose. Being a pronounced democrat, he endeavored to trace in a series of poetic works the democratic tendencies in the culture and political development of Poland. Around these three great poets gathered a number of lesser lights like Zan, Garczynski, Witwicki, Gorecki, Odyniec, and others. But soon the leaders became mystics. Slowacki's poems became so misty and involved that they were no longer understood. However, the clouds of mysticism passed away, and a more speculative and calm attitude towards reality set in among the workers. Wikenty Pol represented the past in an ideal light, Sigismund Kaczkowski and Rzewuski ably seconding him in his efforts. Ludwik Kondratowicz (1823-82; pseudonym Władysław Syrokomla), in his stories in verse, was the inspired singer of the aspirations of peasants and the small bourgeoisie. Lenartowicz (1822-93) took his themes from popular legends, preserving their simplicity in a delicate poetic form. After the apathy immediately following the revolution of 1830-31 wore away, a group of enthusiasts grew up, who wanted another revolution. Among the poets, who, with the exception of Pol and Kondratowicz, were all for revolution, Ujejski in his *Biblical Melodies* and *Jeremiah's Lament* described Poland under the name of Judæa, and his *Choral* became the national anthem. This period of storm and stress evolved two distinct currents of political and philosophical thought in Polish literature: one turbulent (poetry) tending towards revolution, the other calm (novel and romance), towards gradual evolution. The novel, which was originally purely sentimental, received its high state of perfection at the hands of Kraszewski (q.v.) (1812-87).

Modern Period (1862-1900). Kraszewski reflected in his writings all the various currents of thought, ever seeking the "golden mean." Josef Korzeniowski was a deeper psychologist and preached more progressive ideas, especially combating the prejudices of the nobility. Among those who idealized reality, Chodźko, Czajkowski, and the poetess Jadwiga Łuszczewska may be mentioned. Zygmunt Milkowski (pseudonym Jeż) was an energetic champion of democratic ideas even in his historical novels, and Zachariasiewicz with Plug (pseudonym of Pietkiewicz) followed closely in his steps. This period was in the beginning very similar to that subsequent to 1831, only the hope for restoration was weakened still more. The characteristic feature was the growth of the periodical

press, which soon took the lead in the spiritual life of Poland. Books were printed in cheap editions in great quantities, to supply the demand for them among the masses. Positivism, economic questions, the material and spiritual welfare of the country were now of paramount importance. The chief organs for spreading these views were the *Weekly Review* and *Truth*, of the monthlies, the *Athenæum*, representing the progressive elements, the *Warsaw Library* being the mouthpiece of the conservatives. About the middle of the seventies the strife between the two camps lost a good deal of its bitterness. In the three parts of the former Poland all efforts are directed towards the moral and intellectual uplifting of the masses, with the Warsaw weekly, the *Voice*, as champion of the people's rights. All these economic, political, and philosophical tendencies have found expression in literature, lyric poetry being least influenced by the various currents of thought. At the head of lyric poets stand Adam Asnyk (1838-97), master of form, and the passionate Tetmayer. Marya Konopnicka pleads the cause of the downtrodden and oppressed in her lyrics, and she is famous for her short stories. The two writers mentioned have distinguished themselves in the department of drama also. Wiktor Gomulicki is the poet of nature and feeling, possessing an unusually tender and expressive style. The comedy of the present day deals chiefly with social questions in a light, satirical way. It is lively and witty, the situations are natural, and the action is interesting and rapid. The most prominent writer of comedies is Fredro the younger. Historical dramas, written by Szujski and others, are not very numerous, and are not so well liked by the public as dramas of manners and social questions. Among the writers of modern dramas Aleksander Śwentochoński, Wacław Karzewski, and Rabski hold an important place. The chief characteristics of the modern novel are a highly perfected technic and great variety in the subjects, the characters depicted, and the tendencies of the authors. For these reasons the modern Polish novel is more fully representative of the epoch than is drama or poetry. Its brightest names are Sienkiewicz, Bolesław Prus, and Eliza Orzeszkowa. Of the latest writers Klemens Junosza has drawn in a plastic and humorous style the life of peasants, Jews, and the small nobility; Ignacy Maciejowski also depicts peasant life; Balucki lashes the shortcomings of the contemporary Polish nobility; Dygasinski deals with life in the country; Szymański and Sieroszewski (Sirko) depict Siberian life; Zeromski introduces us to the life of the *bohème*. Several rather unsuccessful attempts have been made to introduce novels in the style of the French naturalistic school (although some novelists, like Reymont, exhibit undeniable talent), while other writers try to keep up the traditions of Kraszewski. The periodical *Life*, founded in Cracow in 1897 by Ludwik Szczepański, is the organ of this so-called Young Poland, Stanisław Przybyszewski being the literary leader. Other notable poets are the symbolists Wyspiański and Przymycki (Niriām); some, like Rydel and Kasprzowicz, are also dramatists of great force.

Bibliography. In Polish: Wiszniewski, *History of Polish Literature* (10 vols., Cracow, 1840-57); Maciejowski, *Polish Literature* (3 vols., Warsaw, 1851-53) (both reach only to the middle of the seventeenth century); Kon-

dratowicz, *History of Literature in Poland* (Vilna, 1851-54); Zdanowicz-Sowiński, *Outline of the History of Polish Literature* (ib., 1874-78); Bartoszewicz, *History of Polish Literature* (Cracow, 1877); Dubiecki, *History of Polish Literature* (Warsaw, 1889); Biegeleisen, *Illustrated History of Polish Literature* (Vienna, 1898-1913); Chmielowski, *History of Polish Literature* (6 vols., Warsaw, 1900); id., *Modern Polish Drama* (ib., 1902); Tarnowski, *History of Polish Literature* (Cracow, 1900-05); and many others. The exhaustive *Polish Bibliography* of Karl Estreicher (Cracow, 1880 et seq.) is very important for the period from 1500 to 1800. In German: Lipnicki, *Geschichte der polnischen National-Litteratur* (Mainz, 1873), a short survey; Heinrich Nitschmann, *Geschichte der polnischen Litteratur* (2d ed., Leipzig, 1888); Alexander Brückner, *Geschichte der polnischen Literatur* (ib., 1901); id., in *Die osteuropäischen Literaturen* (Berlin, 1908). A good work in Russian is the second volume of Pypin and Spasovitch, *History of Slavic Literatures* (2d ed., St. Petersburg, 1879-80), which exists in a German translation by Pech, *Geschichte der slawischen Litteraturen* (Leipzig, 1880-84). Consult also G. M. C. Brandes, *Poland: A study of the Land, People, and Literature* (London, 1903).

POLISH MANNA. See MANNA GRASS.

POLISH MUSIC. See SLAVONIC MUSIC.

POLISH SUCCESSION, WAR OF THE. See SUCCESSION WARS

POLITIAN, pò-lîsh't-an, or POLITIANUS, pò-lîsh't-ā'nūs. A celebrated Italian humanist. See POLIZIANO.

POLITICAL AND SOCIAL SCIENCE, AMERICAN ACADEMY OF. A learned society organized in Philadelphia, Dec. 14, 1889, and incorporated Feb. 14, 1891. Its membership has grown rapidly and in 1915 was more than 6300, distributed through the United States and more than 30 foreign countries. Its general advisory committee is composed of representatives of the faculties of the leading American and several foreign universities, the presidents and the secretary are connected with the University of Pennsylvania. Its object is the promoting of political and social science by publishing papers and reports and by the holding of scientific sessions. The annual meeting, consisting of six sessions, is held in Philadelphia in April. Its publication is the *Annals of the American Academy*, a bimonthly volume, each issue of which is devoted to a question of national or international importance along the lines of the political and social sciences. The first issue appeared in July, 1890, and in addition supplements have appeared containing translations of foreign works, and important monographs. There is a series of pamphlets also, containing the principal papers submitted to the Academy, of which more than 900 numbers have been issued.

POLITICAL ECONOMY. The term "economics," derived from the Greek words *oikos* (household) and *nomos* (law or regulation), was used by Xenophon, and, in the spurious treatise attributed to Aristotle, to signify the art of prudent and systematic household management, with particular reference to family income and expenditures and to the labor and satisfaction of the wants of the members of the household. Political economics, or political economy, as the words imply, originally signified the art of

directing the industry, the consumption, the incomes and expenditures of the state and its subjects with frugality and care, and in this sense was first used in the *Traité de l'économie politique*, published by Monchrétien de Vatteville in 1615. The use of the word in this significance soon became general. It was not until the nineteenth century that political economy came to be commonly conceived as a neutral science, divorced from the art of statesmanship. Economics then became the science of wealth, the study of those things that possess exchange value. This view became dominant about 1825, the abstract and theoretical treatment then in favor being divided into three or four topics: the production, consumption, and distribution of wealth (J. B. Say), or the production, distribution, and exchange of wealth (J. S. Mill), most subsequent writers including exchange and a minority following Mill in excluding consumption. Some writers (e.g., Senior, J. S. Mill) proposed to limit the term "political economy" to this comparatively narrow science of wealth; while others proposed to substitute for the term the titles *chrematistics* (Sismondi), *catalactics* (Whately), meaning the science of exchanges. A sharp reaction set in about 1850 against the attempt to increase the precision of the science by narrowing its scope. The Historical school (see below) maintained that the subject of the study was not wealth, but man's relation to wealth; that it was part of a general social science and could not profitably be divorced from ethics and politics. Economics, wrested from its old meaning of household management, is used or defended by Jevons, Marshall, Macleod, Ely, and other leading economists, but it is the brevity and not the clearness of the word that preserves it, since as now used it is affected with all the ambiguity of the longer title.

Content or Scope. The investigation of the social relations and activities connected with wealth may be divided into four stages. In the first stage we describe, classify, define, and enumerate economic phenomena. In the second we analyze and interpret these phenomena for the purpose of revealing cause and effect, of discovering uniformities and sequences or economic laws. In investigating economic uniformities we are virtually forced to certain conclusions about economic progress, and the theory of economic progress determines largely our interpretation of approximate aims and ideals; the determination of these ideals constitutes the third stage. In the fourth stage we discuss means to attain these aims and ideals. We may easily distinguish the stages in which one of these processes far outweighs in importance all the rest. Corresponding to the first stage we have economic history, economic methodology, and economic statistics; corresponding to the second stage is economic theory; to the third stage, the ethics of political economy; and to the fourth stage applied political economy, often but infelicitously called the art of political economy. It should be added that economic theory, also called economics, social economics, theory of political economy, etc., is usually subdivided further into the inductive theory and the deductive theory, and the latter is frequently called hypothetical, abstract, speculative, pure economics, or the pure theory. Briefly stated, the debate over the proper scope of political economy hinges about

the question whether the term "political economy" shall be applied to all or only to a part of these divisions. Some writers (e.g., H. von Scheel, Laveleye, and most German writers) would use the term "political economy" to cover all of them. The leading English economists of the present time would use the term so as to include all except ethics and applied political economy, while the fast-disappearing group of which Senior is the best example attempted to confine the science of political economy to abstract or hypothetical theory. For the purposes of the present discussion and following the usage of Adam Smith and the popular interpretation of the term, we may define political economy as the ordered knowledge of the social phenomena arising out of man's activity in the acquisition and use of wealth.

By wealth we mean goods and services possessing value. We mean useful things of a material nature and personal services that satisfy human wants, which exist in quantities below the amounts desired, so that each unit of them possesses distinct importance for us.

HISTORY OF ECONOMIC THOUGHT

Greece. Greek economic thought is characterized by an exaggerated confidence in the power of the state to mold human nature, control industry, and direct the growth of society. In political thought this resulted in a striking subordination of the individual to the state; in the study of society it led to the subordination of economics to politics and ethics. Slavery was generally indorsed; indeed it was probably regarded as indispensable by the majority. The Greek philosophers fully understood the advantages of the division of labor, and Aristotle entertained correct views upon money and advanced ideas concerning value. The Greek philosophers generally condemned interest taking and entertained the traditional prejudices against trade and commerce.

Rome. The Romans took their philosophy from the Greeks, and though they made important studies of particular economic problems, laborious studies have utterly failed to reveal the existence of anything approaching a dominant system of economic thought. Interest taking, avarice, and trade were generally condemned by the philosophers. Slavery was occasionally condemned—by Varro and Columella as an expensive and demoralizing industrial system, by Seneca on the general principles of the Stoic philosophy. In the Roman jurists we find evidence of systematic thought upon the nature of money, wealth, and capital, the encouragement of population, the regulation of private property and sumptuary control of various kinds, etc. But the general line of historical development is from Aristotle to the Christian Fathers and more particularly to the mediæval Canonists.

Christianity. The immediate effect of Christianity was to strengthen in general the prevalent Aristotelian system of economic philosophy, its condemnation of usury and the pursuit of wealth in trade, its assertion of the superiority of agriculture, and its support of the social system of status. Christianity thus strengthened the subjection of economics to ethics, but it weakened the subjection of economics to politics. Within the Church the equality of men before God was taught, also the essential dignity of

labor. The clergy were permitted to earn their own livelihood by manual labor, and the laity were exhorted to free their slaves as soon as they became Christians.

Middle Ages (400-1500 A.D.). Inasmuch as the teachings and doctrines of the early mediæval writers are well summed up in the *Corpus Juris Canonici* (see CANON LAW), it will be convenient to discuss them under the general heading of the canonists—the schoolmen and theologians who after the compilation of ecclesiastical laws by Gratian in the twelfth century analyzed and expounded, among other things, the relation to economic affairs of the Scriptures, the writings of the Christian Fathers, decisions of Church councils, and papal decrees. The doctrines of the canonists were derived largely from the scriptural injunctions against the excessive pursuit of wealth and the payment or acceptance of interest on loans. The early Fathers, in their condemnation of avarice and their exaltation of fraternal love, sometimes used expressions which taken by themselves imply an utter condemnation of private property and an advocacy of communism among the faithful, but this was only an ideal, and private property was early recognized as a necessity resulting from the fall of man. The effect of this ideal, however, appears in the accepted doctrine that the maintenance of the poor was not a matter of philanthropy, but an obligation. The scriptural attitude towards wealth led to an emphatic statement of the moral superiority of agriculture and handiwork over trade and commerce as a means of earning a livelihood; and the early writers seemed almost unanimous in the belief that what the seller made by trade the buyer necessarily lost. With the increasing temporal power of the Church and the great development of commerce which marked the eleventh century, came the necessity of harmonizing the doctrines of the Church with the obvious requirements of commerce, and many concessions were made by the later canonists. Thomas Aquinas (c.1226-74), the most authoritative of the later mediæval canonists, concedes that it is lawful to trade for a simple livelihood, or in order to supply a country with necessary articles which it does not produce within its own borders, or when the profits of the trade are devoted to some honorable purpose such as the assistance of the poor, but that, save in exceptional circumstances, a seller is bound to reveal a fault in an article, and that it is not permissible to sell an article for more than its worth. The fundamental axiom, in accordance with which all these conclusions are reached, is that every commodity has a fixed and objective value, which can be readily ascertained and which determines its just price. To ask more for an article than its just price was extortion, and to pay less was equally unjustifiable. The distinctively ethical point of view of the canonists is shown in the prohibition of usury (q.v.). This was based upon the scriptural injunctions against usury and upon the Aristotelian argument that, money being barren, it would be extortion to charge for its use. Another favorite argument was that interest was pay for time; but time is barren, and hence to demand interest was to demand something for nothing. It is needless to add that, as the growing commerce of the Middle Ages made the need of borrowing capital more and more imperative, the canonical theory was stretched so

as to accommodate many ingenious forms of contract for what was practically, though not nominally, usury. In the latter half of the fifteenth century the Franciscans themselves instituted the *monts-de-piété* (q.v.), or charitable banks for loaning money to the poor, and a small interest rate was imposed in order to defray the expenses of management. By the middle of the sixteenth century the Church had virtually abandoned its effort forcibly to suppress avarice and the pursuit of wealth.

Mercantilists (1500-1750). Mediæval economic theory had been dominated by ethical considerations; the economic thought of the early modern period was dominated by political necessities. Both the feudal system and the temporal power of the papacy had been undermined by the growth of the great modern monarchies. The problems and needs of the national states absorbed the best thought of the age. The most pressing problem of the new national governments was how to secure greater revenue. Philosophers and publicists, who would not have stooped to the elucidation of the laws of private wealth, bent their best energies to the solution of problems arising out of the establishment and maintenance of particular states. The problem of the economic thought of the period was, however, a larger one than the mere raising of the public revenue. It was requisite that this revenue should be secured in that form—ready money—which is most easily transformed into armies, navies, and the other material embodiments of national power; and the problem included, in addition, the necessity of finding or creating some more productive source of taxation than the backward agriculture of the period. With the problem of the mercantilists plainly before us it is easy to understand the characteristic features of the mercantile system which are described under that title. "Mercantilism," says Schmoller, "in its innermost kernel is nothing but state making—not state making in a narrow sense, but state making in the modern sense, which creates out of the political community an economic community." The restrictive regulations, discriminating laws, and state interference which Adam Smith and his immediate successors described as the essential features of mercantilism, we now know to have been in a sense incidental. State interference was distinctly a minor consideration—minor in the sense that it was not the problem at issue. Moreover, the mercantile system resulted, not in a loss, but in a net gain of industrial freedom. Contemporaneously with the imposition of those external restrictions that mark the mercantile economy went a rapid and extensive abolition of internal restrictions which had been far more numerous, brutal, and destructive than the new external regulations that succeeded them. The economic and political unit had merely increased its size. While mercantilism is the most important phenomenon of economic thought in the sixteenth and seventeenth centuries, it constituted only a part of a widespread and eager investigation of concrete economic facts. It was these studies that gave the political economy of Adam Smith its rich content of concrete phenomena. Money, banking, the rise of prices, population, poor relief, etc., were all extensively discussed in brochures and monographs. The maintenance of the poor was a continual subject of pamphlet and tract; and in the communistic *Utopia* of

Sir Thomas More we have striking evidence that the problem of poverty was occupying the attention of the best thinkers of the time. The study of statistics became widespread, and actuarial science and the investigation of social statistics were carried really to an advanced point. Neither is it correct to refer, as many have done, to the writers of this period as empiricists. Economic study had been divorced from ethics and theology, it is true, but at the hands of Bodin, Grotius, Pufendorf, Hobbes, and Locke economics was developed as an essential part of a general political philosophy. In the *De Jure Belli et Pacis* of Grotius (1625), particularly, the whole mercantile system is in reality brought to judgment before the greater doctrine of international equity, and we have a new application of the old doctrines of natural law and natural liberty, doctrines which were destined to play a greater rôle in modern economic science than the whole mercantile system.

Physiocrats. Mercantilism had been marked by a narrow favoritism of commerce and manufactures; a reaction in favor of agriculture was inevitable. The mercantilist doctrine had been characterized also by an enthusiastic, though not less narrow, nationalism; it was natural, then, that the reaction in favor of agriculture should ally itself with the broad principles of natural law and liberty expounded in the works of Grotius, Pufendorf, and Locke. This reaction in favor of agriculture and industrial liberty found expression in the doctrines of the so-called physiocrats (q.v.). The rise of the school may be dated from Quesnay's first economic monograph, which appeared in 1756. As is implied in their name, the fundamental doctrine of the physiocrats is the subjection of economic and political phenomena to natural law, which as interpreted by them gave rise to the familiar political doctrine of radical individualism and a certain materialistic conception of wealth which explains in a way all their peculiar economic theories. As Adam Smith noted, the physiocrats treated not only of political economy, "but of every other branch of the system of civil government," and their political and economic theories were indissolubly fused in their general doctrine of a beneficent natural law of industrial freedom, according to which the largest production and justest distribution of wealth would be best secured by permitting each individual to "pursue his own interest in his own way," so long as he did not infringe on the like liberty of others. This theory, perpetuated and popularized by Adam Smith, has exercised probably more influence upon subsequent thought than any other economic doctrine ever formulated.

While the physiocrats fully exposed the error of confusing wealth with the precious metals, they themselves fell into the error of confusing wealth with material objects. Identifying the production of wealth with the production of raw materials, they concluded that manufactures and commerce, which merely change the position or form of raw materials, are barren and unproductive, though useful and desirable when strictly subordinated to agriculture; that the value added to raw materials in the processes of trade and industry is equivalent merely to the cost or expenses of production, while agriculture yields a net surplus—*produit net*—over and above the expenses of production. To Quesnay, however, the large agricultural em-

ployer, not the agricultural laborer, was the real producer of wealth; and the physiocratic theory is especially strong and advanced in its analysis of capital. Agriculture being thus the sole ultimate source of national revenue, simplicity, economy, and justice demanded that the revenue of the state should be raised by a single direct tax—the *impôt unique*—levied upon rent. See SINGLE TAX.

Adam Smith, whose *Wealth of Nations* appeared in 1776, is easily the foremost figure in the history of economic thought. Next to his influence in hastening free trade and in popularizing and dignifying the systematic study of wealth, Smith's most important service, perhaps, was in divorcing political economy from ethics and in part from politics. This appears plainly from the outline of his lectures, which were divided into four parts: I. Natural Theology; II. Ethics, incorporated in his *Theory of Moral Sentiments*; III. Justice or Jurisprudence; IV. Political Economy. The attitude of Adam Smith in the *Wealth of Nations* is essentially this: assuming that the object of the study is to increase the national wealth as much as possible, this object will be most effectually secured by perfect industrial liberty. He left the prior question of the desire for wealth to the *Theory of Moral Sentiments*. On the other hand, he did not succeed so well in separating politics from economics. He could not get without the bounds of political philosophy, because his ultimate purpose was to prove the supreme efficacy of the doctrine of *laissez-faire*. Yet before he could lay down maxims for the increase of wealth it was necessary to inquire how wealth was actually produced and distributed, and in doing this disinterested work of science he ceases to be the advocate. It was this passionate analysis of production, value, and distribution which had the greatest effect upon the economists who followed him and which led to the attempt to formulate a nonpartisan science of political economy that should pass no ethical or political judgments. It must never be forgotten that Adam Smith was not wholly consistent in the development of his theories. At times he seems to hold that education should be left wholly to private initiative, but again he classes it among the necessary functions of government. In places he seems to hold a brief for "perfect industrial liberty," yet he does not hesitate to recommend the state regulation of banking, and his characterization of the Navigation Act as "perhaps the wisest of all the commercial regulations of England"—purely on political grounds—is famous. The most potent single quality of Smith's work was its so-called universalism. His work dealt with the wealth of nations, not with that of a particular nation or a particular epoch, and his confidence in the existence of a natural law of universal applicability left an indelible impression upon subsequent thinkers. Granted the existence of such a law, the conditions of time, place, race, and nationality must be matters of secondary importance. The superiority of the deductive method naturally follows.

Classical School. The economic thought of the early part of the nineteenth century was dominated by a group of writers including Bentham, Malthus, J. B. Say, Ricardo, McCulloch, James Mill, and others, who have been variously designated as the Classical, Orthodox, Ricardian, or English school. The leaders of this school

differed upon points of economic doctrine, but the general system of thought developed by them is strikingly harmonious—deductive in method, pessimistic in tone, utilitarian and materialistic in its assumptions, and cosmopolitan in the sense that its ultimate scientific ideal was the discovery of universal economic laws applicable to all nations at all times.

Jeremy Bentham (1748-1832) gave the classical economy its ethical framework through his formulation and tireless propagation of the utilitarian philosophy. Utilitarianism in its early form was largely an application to ethics of the individualistic doctrine of self-interest which Smith and the physiocrats had applied so skillfully in the field of political philosophy. "To obtain the greatest portion of happiness for himself is the object of every rational being," says Bentham. All that was materialistic, pessimistic, and mechanical in the classical system of political economy seems to have been magnified and intensified by the famous *Essay on the Principle of Population* by Malthus (q.v.), who in his fondness for the historical method of research was in marked contradistinction to the men about him. But his favorite method had little or no effect upon the classical political economy, while his famous doctrine that population tends to increase faster than food became the very backbone of the classical economy and modified almost every department of human thought. It may, indeed, be said that while Adam Smith investigated the causes of the wealth of nations, Malthus gave an exposition of the causes of poverty, and the contrast is not unfair. The one was essentially an optimist, the other, if not himself pessimistic, certainly gave a more pronounced impetus to pessimistic tendencies than any other economist in the history of the science. From the scientific standpoint the most important use made of the Malthusian proposition was in the Ricardian theory of distribution.

David Ricardo (1772-1823) held that as a country grew and population increased society would be forced to resort to poorer and poorer soils to obtain its supply of food, the law of diminishing returns would set in, and as the margin of cultivation was forced down an increasing share of the product of industry would go to the landlord in the shape of economic rent—the difference between the natural productivity of the better land and the worst land in cultivation. Excluding rent, the division of the remainder of the product between the laborer and the capitalist was determined by a corollary of the Malthusian principle—the "iron law of wages." In the long run, Ricardo held, wages would tend to equal the cost or price of the food, necessities, and conveniences required for the support of the laborer and his family in their accustomed style of living. Profits, naturally, consisted of the product minus rent and wages; they were "the leavings of wages." Ricardo's theory of progress, then, is clear. With the passage of time and the settlement of the country, rent would absorb a larger share of the produce, increasing both absolutely and relatively; wages would absorb a larger share, increasing relatively, but remaining constant in amount (with a tendency, however, to decrease as rents rose higher and higher); while profits would necessarily decrease both absolutely and relatively. This theory of distribution was developed as an integral part of his famous cost

of production theory of value, i.e., that commodities will tend to exchange in quantities proportional to their respective costs of production. In stating this theory Ricardo at times spoke as if all the expenses of production could be resolved into the toil and sacrifice of labor: commodities, he was fond of saying, tend to exchange for each other according to the respective amounts of labor embodied or realized in each. He thus supplied the Socialists with their celebrated labor theory of value, according to which labor is the sole cause of value and in consequence is entitled to the whole produce of industry. To a great extent Ricardo molded the economic thought of the day and has greatly influenced the later economists. The Socialists took from it, illogically perhaps, the iron law of wages and the labor theory of value. Henry George took from it, but logically in this case, the doctrine that progress itself means poverty so long as private property in land is permitted. Finally, Ricardo's theory shifted the centre of economic interest from the landowning classes to the capitalist class.

English Political Economy since Ricardo. The narrow scope, the deductive method, and the theoretical nature of the classical economy were all intensified and formally indorsed by N. W. Senior (1790-1864), the most influential English economist between Ricardo and the younger Mill. Within the limits of classical economics Senior did notable work: he cleared up many of the latent obscurities in the Ricardian theory of distribution, propounded the abstinence theory of interest, and formulated the famous doctrine of the wages fund (latent in the work of Smith, Ricardo, and others), that the average rate of wages is the quotient secured by dividing the number of workmen into the fund of capital set aside by the capitalists for the employment of labor. With the exception of the Malthusian principle, this doctrine probably contributed more than anything else to make political economy the "dismal science." Senior is remarkable also for his exposition of the extent to which the monopoly element enters into ordinary economic life. Under perfect competition, he declares, prices of commodities would accurately measure "the aggregate amount of the labor and abstinence necessary to continue their production." But he points out repeatedly that differential advantage of any kind in production gives rise to a monopolistic rent, which includes all income obtained without a proportionate sacrifice of labor or abstinence.

John Stuart Mill (1806-73) typifies the transition in England from the classical to the modern system of economic thought. He began his career as a Ricardian of the Ricardians, but in the later years of his life he came under the influence of Auguste Comte and the Socialistic thought of his time, and in 1848 his principal economic treatise appeared under the title *Principles of Political Economy, with Some of their Applications to Social Philosophy*—a queer compromise between the Ricardian economics, which he had learned in his youth, and the warm desire to find some means of improving the condition of the masses, which had come to him from the observations of his maturer years. The compromise was not fortunate from the standpoint of logic. Most economists since Mill, and Mill himself in his later years, recognized that the book was inconsistent; but it was superbly written, alive with the desire to improve the con-

dition of the masses, and it exercised an enormous influence upon the subsequent development of English economic thought. The modifications of the old doctrine which Mill introduced exercised probably a greater influence than the old theories which he incorporated in his *Principles*. He preserved the old doctrines of rent and profits and advocated *laissez-faire* as a general principle of political expediency, but made so many exceptions that at times they seem more important than the rule. Mill indorsed also the doctrine of the wage fund; but in his later years he abandoned his belief in this theory and advocated "views of the taxation and regulation of inheritance and bequest which would break down large fortunes and bring about a wider diffusion of property."

The development of English economic thought since 1850 has been profoundly affected by the reaction against the classical system described below, and only a few words can be devoted to the subject here. The logical successors of Ricardo and Senior were Cairnes, Bagehot, and Fawcett (to whom might be added Professor Marshall of Cambridge). It is impossible to characterize at length the work of these men, but all have been ardent defenders of the orthodox school, though they have recognized and ably expounded its limitations as a theoretical science. They stand as the modern defenders (Fawcett an extreme partisan) of the deductive type of economic theory. In Thorold Rogers, Cliffe Leslie, Arnold Toynbee, and Professors Ashley and Cunningham we have a group of historical economists who have made important contributions from the historical standpoint and have indorsed more or less completely the general views of the Historical school. (See below.) Jevons stands at the head of what might be called a psychological school of political economy, of whom perhaps the most distinguished living British exponents are Professor Edgeworth of Oxford and Professor Smart of Glasgow. Both Jevons and Edgeworth, however, have made important contributions in every branch of the science, particularly that of statistics; and the attempt to classify such men as Bagehot, Jevons, Marshall, Edgeworth, and Nicholson reminds us forcibly that the period of schools has fortunately passed. The representative English economists, like those of every other country, make the most of all schools and methods, deductive, historical, psychological, statistical, and mathematical.

Modern Reactions against the Classical System. Socialism. The earliest and most passionate protest against the classical economy came from the Socialists. (See SOCIALISM.) The antagonism between Socialism and the classical economy is fundamental and irreconcilable. The foundation of the latter was *laissez-faire*, and its theories were built around the system of private capitalistic enterprise; while Socialism is in essence a protest against *laissez-faire* and the private ownership of capital. The rise of modern Socialistic doctrine may conveniently be dated from William Godwin's *Inquiry Concerning Political Justice* (1793), although Godwin himself was inclined towards anarchism; but the chief bond uniting the early Socialists was their common hatred of the orthodox political economy. In recent times, largely under the influence of Karl Marx (q.v.), Socialism has acquired a positive theory which is adopted with substantial unanimity by the great mass of

people who may correctly be called Socialists. Logically enough this "scientific Socialism" has its roots in the Ricardian theory of value and distribution. Mutilating his theory of value and interpreting it ethically, they assert that, as labor is the sole cause of value, the laborer is entitled to the whole produce of industry. They accept a part of his gloomy law of wages, magnify the class antagonism inherent in his theory of distribution, and glory in the pessimism that unconsciously pervaded his analysis. On the basis of a broader historical survey than Ricardo permitted himself to make, they confidently assert that the régime of capitalism is but a temporary stage in industrial evolution and that it must inevitably give way to a régime of collective production. Marx's theory of value has met little but criticism from the economists, but his doctrine that the underlying causes of all social phenomena, such as religion, literature, and art, are economic in character—called by him the materialistic conception of history—has profoundly influenced the science, particularly in Germany.

Sociologists. To the sociologists may be ascribed the most fundamental and inclusive protest against the methods of the Classical school. The Ricardians aimed at an abstract science of rigid precision, universal in application, raised above the limitations of particular epochs and national boundaries. They were thus led to neglect history, custom, law, and ethics; they spoke as if the existing stage of economic development was permanent, and their method of treatment was predominantly deductive. The most effective protest against these exaggerations was made by the Historical school, which will be noted hereafter; but a more fundamental protest, and one prior in a point of time, was made by Auguste Comte (1798-1857), the father of modern sociology. He exercised great influence in shaping the methods of political economy and marking out its particular place among the social sciences. The influence of sociology upon modern economic thought will be discussed more fully in the article SOCIOLOGY.

Historical School. The most influential reaction against the classical economy was that inaugurated by what is known as the Historical school of Germany, and is usually dated from the work of Lorenz von Stein, *Der Sozialismus und Communismus des heutigen Frankreichs*, written in 1842, or, more correctly, from Wilhelm Roscher's *Grundriss zu Vorlesungen über die Staatswirtschaft nach geschichtlicher Methode*, published in 1843. Two contemporaries of Roscher, Bruno Hildebrand and Karl Knies, must be associated with Roscher and Stein in the introduction of this method, which has transformed economic science in Germany and profoundly affected it the world over. The positive doctrines of these writers, briefly summarized, maintain the propositions that economics is a social or political science which can be profitably pursued only in connection with the other sciences of social or political life, particularly administration, law, and history; and that not only are economic phenomena conditioned by general social and political institutions, but that these institutions are products of an ordered historical development, so that the economic science of any particular nation can be studied and formulated only in connection with the historical development of that nation. Thus, instead of a universal political economy we

have a historical national economy. From the standpoint of method the work of the Historical school was simply an application to economic investigation of a method that had been developed and popularized by Grimm, Savigny, Eichhorn, and other German investigators in philology, history, and jurisprudence a generation before the rise of the Historical school of political economy. What may be called the nationalistic spirit of the school was the result of irresistible political forces of the day, first expressed in the economic publications of Friedrich List (1789-1846). Germany was in the process of developing into a great empire, and, as has been pointed out in connection with the mercantile system, such a period in the life of a nation is almost invariably attended with protective legislation designed to make the new state industrially as well as politically independent and homogeneous. The new German economics simply expressed these economic and political tendencies, to which attention had been called by List. The work of the German economists who succeeded Roscher, Knies, and Hildebrand has been marked by a predominant use of the inductive method and a close adherence to actual economic phenomena; by special study of the effect of legal institutions, custom, law, and ethics upon economic phenomena; by an intermediate attitude between extreme protectionism and extreme free-trade views; and by a discriminating sympathy with the claims of Socialism. Quite generally they look to the state rather than to individual initiative to solve the problem of poverty, and they have thus become known as *Kathedersocialisten* (Socialists of the professorial chair), or State Socialists, as contrasted with the Social Democrats, whose radical programme they refuse to indorse.

The American reaction precedes in point of time the National Oekonomie of Germany, and, like the latter, had its source in the political problems attendant upon the rise of a new state. The first systematic protest came from an early group of publicists, among whom may be mentioned Alexander Hamilton, Daniel Raymond, Matthew Carey, Hezekiah Niles, and Friedrich List. Daniel Raymond is the author of the first treatise on political economy in which a distinctively American system was advanced. His first work, *Thoughts on Political Economy*, appeared in 1820, and undoubtedly attracted a good deal of attention in certain circles. The fundamental idea of Raymond's system is his conception of wealth. Wealth, he held, is not an aggregation of exchange values, such as Adam Smith had conceived it, but the capacity or opportunity to acquire the necessities and conveniences of life by labor. The English political economy, he held, was a study of exchange values, of private economy as opposed to national economy, and the laws of wealth laid down by Adam Smith were untrue of a nation conceived as a unity. Extending his doctrine of wealth, he maintained that the interests of one class do not always coincide with the interests of the nation as a whole, and that national wealth in its true sense will be most rapidly increased by developing all the national powers to their widest possible extent. He is, thus, a warm advocate of protection as opposed to the doctrine of *laissez-faire*.

We come to a second period of development in American economic thought with Henry C. Carey (1793-1879), by far the most influential

of the earlier American economists. Carey's work is especially noteworthy, not only for his earnest defense of protection, but also for his economic optimism and his continued attacks upon the Ricardian school. Drawing his lessons from American experience, he flatly denied the Malthusian principle and the law of diminishing returns. Carey's position upon these points was undoubtedly well taken for the America of his time, and although it is questionable whether he was justified in defending the exact converse of these propositions, he did unquestionably show that the fundamental premises of the classical economy were not universally applicable. Carey defended a broad social conception of wealth similar to that held by Raymond, defining it as the measure of power which man has acquired over nature, while "the value of an object expresses the resistance of nature which labor has to overcome to produce the object." Carey thus was led to propose the theory that the value of an object depends rather upon the cost of reproduction than upon the cost of production. Perhaps the central doctrine of his system is that of association. The increase of wealth, the increasing mastery of man over nature, the development of a nation's powers, Carey held to be dependent upon the increasing association resulting from a compact population following diversified pursuits with a close interrelationship between agriculture and manufactures. It was this optimistic belief in the possibilities of increased association that led him to advocate protection and to survey an increasing population with the greatest complacency. Since Carey's time other American economists, like Henry George and Francis A. Walker, have exerted a world-wide influence upon economic thought. The younger generation of American economists have been largely trained in the German universities, and have in the main accepted the positive doctrines of the German Historical school. Without depreciating the work of the great English economists, it may be said that American investigation is marked by the attempt to test and supplement deductive reasoning by an appeal to statistics, law, and history.

Austrian School. This represents a reaction within the limits of the classical economy itself. The name, "Austrian school," is used simply because the marginal utility theory of value, which constitutes the essence of this reaction, has been most thoroughly developed and most widely applied by a group of Austrian economists, including Professors Menger, Wieser, Sax, and Boehm von Bawerk, though the theory itself was propounded almost simultaneously in 1871 by Professor Jevons in England and Menger in Austria, and is now used by a large majority of economists everywhere. The adherents of this school held, in brief, that the utility (i.e., power of satisfying want) possessed by a commodity decreases per unit as the amount consumed increases, and that value itself is dependent upon the utility of the last or marginal increment of the commodity supplied for consumption. It cannot be doubted that they have transformed economic theory; the old unit of real value—the pain and sacrifice of labor—has given way to a unit of utility; and the cost-of-production theory of exchange has been replaced by a wider conception, which holds that value determines the expenses of production rather than that the expenses of production determine value; that

capital receives its value from the finished product, and not vice versa; etc. The whole tendency of this theory (see *VALUE*) has been to shift the centre of gravity in economics from the capitalist to the consumer and to block the movement to confine political economy to a study of exchange value. It has undoubtedly clarified our general conceptions of wealth and exchange much in the same way that the theory of evolution has clarified our general conception of progress.

SCOPE AND METHOD

Relation of Political Economy to Sociology. The most inclusive and fundamental question of scope is the relation of political economy to the general science of human association. Two extreme views of this relation have been maintained: (1) that because of the intimate and inseparable connection between all forms of social activity, the study of economic phenomena cannot be divorced from the general study of sociology (e.g., Comte, H. von Scheel, Ingram); (2) that political economy is an absolutely independent science, dealing with the phenomena of wealth alone (e.g., Senior, Mill, Cairnes). At present there is a strong consensus of opinion that both these views are ill advised. While it is now admitted with virtual unanimity that political economy is a social science, the bewildering complexity of social phenomena, together with the slow progress of sociology conceived as the general science of human association, has deeply strengthened the conviction, borne out in other departments of scientific investigation, that specialization and the isolation of phenomena are indispensable.

Relation of Political Economy to Ethics, Law, and Politics. In discussing this question attention may be confined largely to the relationship between ethics and political economy, since the decisive arguments apply to all three relationships. Substantial unanimity exists upon the following points. (a) that ethics and economics are, for purposes of investigation at least, two distinct sciences; their fields are not coextensive; (b) in applied political economy we must take account of ethical requirements; no economist would maintain that in actual life men are "freed from the ordinary obligations of justice and humanity"; (c) in so far as ethical forces affect economic activity, economic science must take account of these forces. The point at issue is the question whether the scientist, as scientist, is permitted or compelled to set up ideals and pass ethical judgments. The following reasons may be given for the conclusion that it is virtually impossible for the scientist to abstain from passing ethical judgments: In the first place, every rational adult understands and accepts certain axiomatic ethical canons which in their practical application are universally accepted (e.g., that the satisfaction of hunger is a good thing). In the investigation of actual economic phenomena, such as the housing and food of the laboring classes, conditions are continually met with that violate these ethical canons. It would be the sheerest pedantry under these conditions to refrain from passing ethical judgments. Secondly, an essential part of economic science is that subdivision which treats of economic progress. In economic life what ought to be done is intimately dependent upon what can be done; in other words, the law of economic growth is a powerful, if not

the most powerful, factor in determining economic aims and ideals. If the fully equipped economist is forced to study economic growth and to explain economic movements and tendencies, it follows that he is forced to express opinions upon approximate economic ideals, and, having furnished the decisive arguments for ethical judgments, he must either apply his results or have some less well-qualified person apply them for him. Additional reasons appear when we examine such subjects as taxation or those public prices which the law declares must be just and reasonable. In the consideration of railroad rates, e.g., the economist is not only compelled to pass judgment upon what is just and reasonable, but he discovers upon investigation that economic considerations supply the most important factors in determining this judgment. There is, then, a broad zone of territory between ethics and economics which the moralist has not worked—and which for the science of ethics is probably unimportant—but which the economist must clear up before he can go on with his work. The assertion that the science of political economy may and should refrain from passing ethical judgments rests upon two misapprehensions: (1) the failure to grasp the fact that society is like an organism in that it is subject to a law of ordered change, which to a certain extent is under the control of the organism itself; (2) an illogical conclusion from the recognized truth that certain subdivisions of economic investigation (e.g., fixation of prices in wholesale markets) may be exploited quite thoroughly without determining economic ideals and without introducing ethical considerations. From this it is logical to conclude that certain minor subdivisions of political economy may be investigated "without passing ethical judgments," but illogical to conclude that the whole science may be so investigated and formulated. The foregoing conclusions are strengthened when we consider the relation of economics to law or politics. In describing the progress of the past or the conditions of the present we are forced to pass judgment upon the economic success or failure of many laws and policies (e.g., tariff laws) which are still in force or under active consideration and which will be indorsed or repudiated solely or largely upon economic grounds. Because of this fact the economist cannot refrain from passing judgment upon laws and political policies. Nor without being ridiculous can he refrain on occasion from laying down precepts. Gresham's law, e.g., is at once a law and a precept when a proposition is under consideration to maintain two kinds of money of differing degrees of value in circulation, side by side. In conclusion it may be said that, while political economy does not undertake the complete study of law, ethics, politics, etc., it must consider systematically the parts of those sciences that materially affect economic phenomena. It is neither possible nor desirable that the line of demarcation should be rigidly drawn, particularly in the applied science or art of political economy, which may be defined as the application of economic laws to the solution of those practical problems in which economic considerations are of predominant importance.

Relation to Other Sciences. Political economy is probably more dependent upon history than upon any other science, and indeed an extreme wing of the Historical school, of which Schmoller is the most prominent example, holds

that until a larger store of historical results is accumulated it is of little use to attempt broad theoretical generalizations, thus confining economics for the present to the philosophy of economic history. This position seems untenable because of the evident logical deficiencies of the historical method when used alone and because new problems are continually arising upon which history throws little light. (See *Deductive Method*, below.) While the great majority of economists refuse to admit that political economy is merely history, the importance and necessity of economic history are now universally conceded. Dr. Keynes classifies the functions of economic history in connection with economic theory as follows: "First, to illustrate and test conclusions not themselves resting on historical evidence; secondly, to teach the limits of the actual applicability of economic doctrines; thirdly, to afford a basis for the direct attainment of economic truths of a theoretical nature."

The connection with psychology is particularly intimate. As a study beginning with human effort and ending with the satisfaction of human wants, economics really has its beginning and its end in psychology. The theory of value, particularly, takes its fundamental axioms from psychology (e.g., that the satisfaction afforded by commodities decreases per unit as the amount consumed increases).

Deductive Method. What is known in economics as the deductive method consists usually of three stages, the first and last of which are inductive. In the preliminary stage, either from common observation or more complex induction, the postulates of the deductive science are secured. In the English economic theory prevalent from Ricardo to Cairnes these postulates were excessively simplified. Ricardo, like Adam Smith, was fond of drawing his premises from an imaginary state of primitive industry. Senior reduced the postulates of political economy to four general propositions: "(1) That every man desires to obtain additional wealth with as little sacrifice as possible. (2) That the population of the world is limited only by moral or physical evil, or by fear of a deficiency of those articles of wealth which the habits of the individuals of each class of its inhabitants lead them to require. (3) That the powers of labor, and of the other instruments which produce wealth, may be indefinitely increased by using their products as a means of future production. (4) That, agricultural skill remaining the same, additional labor employed on the land within a given district produces in general a less proportionate return." It is impossible to give a list of the postulates which have been assumed by different writers, but it is evident that they must vary widely in different branches of the science and that almost every deductive writer has unconsciously assumed many postulates not specifically stated. In the ordinary deductive treatment of value and distribution the following propositions are usually postulated: that men not only desire but know how in general to obtain the maximum satisfaction with the minimum effort; that certain industries are subject to the law of increasing rather than diminishing returns; that the satisfaction afforded by a commodity decreases (per unit) as the amount consumed increases; that existing law, public opinion, and ethical standards in general remain constant. It is the inter-

mediate stage that is most appropriately called deductive. Here the familiar processes of the deductive logic are employed. It is evident, however, that the results obtained from the artificially simplified premises of ordinary deductive theory are of doubtful value. If the postulates be absolutely true and the deduction faultless, the conclusions express abstract tendencies which will be modified in real life by the action of secondary forces not taken into account in the premises. This, however, is the character of the pure theory of all sciences. If, on the other hand, the premises practically cover the predominant forces in any domain of economics, they may yield results capable of explaining actual economic conditions and capable of affording the basis of prevision. In actual usage, however, these postulates have been sometimes untrue, often ambiguous, and always more numerous than was explicitly stated; so that Cliffe Leslie and other writers of the Historical school have characterized the conclusions of English theory as utterly inapplicable in any sense either to the explanation of existing conditions or to the solution of practical problems. This extreme antipathy to deductive theory is, however, plainly illogical. Whatever the necessity of studying the past, no one denies that the present and the future furnish the ultimate and principal problems of the science. And many of these problems are new; to solve them we must isolate the factors at work, calculate separately their effects, and try to estimate the net results. This process must be largely deductive, and it is strange that those who insist most strenuously that the science is purely practical should attack a method necessary in the solution of practical problems. The historical method alone is helpless in the face of such a problem as the proposition to introduce compulsory arbitration.

Of the third stage in the deductive process, that of verification by observation, little need be said. In practice it is exceedingly difficult, as was shown when Mill attempted to apply the Ricardian theories, but it is essentially a species of induction subject to all the limitations of the inductive method in general.

Inductive Method. The ultimate aim of the inductive method is by systematic analysis and comparison of concrete economic phenomena "to observe the effects of a cause coming singly into action while all other forces remain unaltered." The attempt to do this gives rise to two inductive processes—the method of difference and the method of agreement. In the method of difference we compare circumstances exactly similar with the exception of one factor in order to discover the effect of that factor. The chief instrument of the method of difference is thus the experiment, to which may be added in economics the observation of extraordinary instances in which the conditions of an experiment are closely approximated by some fortuitous or extraordinary event. Thus, the Black Death in England furnishes a striking exemplification of the effect upon wages of a sudden diminution in the supply of labor. In theory the method of difference requires that the collateral or surrounding circumstances shall be absolutely alike. This condition is seldom fulfilled even approximately, and hundreds of instances might be cited in which the method has been abused. Finally, it is to be noted that the method of difference, while entirely satisfactory where the conditions are perfect, is always nar-

row and restricted. It shows with certainty that a given cause in a certain set of circumstances can produce a certain result, but tells us nothing of what will happen in another set of circumstances.

To generalize, to establish uniformities, use is made of the method of agreement. Here we compare circumstances wholly different, with the exception of two phenomena between which we expect to establish a causal connection. The casual connection is indicated by the repeated conjunction of the two phenomena. If we examine the movement of exports and the movement of the marriage rate, and find that a rise in the exports per capita is always accompanied by a rise in the marriage rate, we are safe in accepting this connection as an economic uniformity or law, provided that we have examined a very large number of instances in which the collateral circumstances have been infinitely diverse and varied. Theoretically this method requires that we should exhaust every possible combination of circumstances before concluding that a rise in the exports per capita will always cause an increase in the number of marriages.

With respect to the general utility of the inductive method, it is plain that, though little can be done without it, it seldom, if ever, suffices to convince. Take the case of the exports and the marriage rates cited above. Hundreds of instances might be adduced from English statistics in which a rise in the per capita exports has been followed by a rise in the marriage rate. Yet no one believes that a mere increase in exports would cause an increase of marriages. Both are evidently the results of a single cause—active business, etc. Brisk trade, high wages, steady employment, etc., stimulate marriage and show themselves usually in an increased volume of exports, yet if commercial prosperity at any time increased without stimulating exports, we have every reason to believe that the marriage rate would rise irrespective of exports. And in less developed countries, where trade and commerce are relatively unimportant, no connection is observed between exports and marriage. The great difficulty of induction in economics is owing to the complexity of economic phenomena: we are seldom able either to bring about a satisfactory experiment or to secure a sufficiently diverse number of instances of agreement. Current literature is full of sweeping generalizations based upon far less agreement than that observed between marriages and exports. The 25 years preceding the repeal of the Corn Laws in England were, on the whole, far less prosperous than the 25 years that succeeded the repeal; *ergo*, concluded many writers, free trade would be advantageous to every country of the world. On the other hand, the method of agreement has been equally abused. Because the creation of the great modern European monarchies was in most instances accompanied by protective tariffs, colonization schemes, and a certain harshness and brutality towards strangers, therefore, concluded the extremists of the German Historical school, it is not only expedient, but ethically right, that the German Empire in the last half of the nineteenth century should begin with protective tariffs, colonization schemes, and the policy of the mailed fist. To-day it is universally conceded that both methods must and should be used wherever possible.

Other Methods. In actual practice a large

number of complicated combinations of the deductive and inductive methods are used in economics. Induction in its quantitative aspect gives rise to the statistical method. No school of political economy has ever disputed the importance and value of statistics, and in the last few years it has made more rapid progress, perhaps, than any other branch of the science. This is due to the increased public expenditures in statistical investigations and the impetus given to the improvement of the study by such associations as the International Statistical Institute, the Royal Statistical Society, and the American Statistical Association. So great has been the development of statistical technique at the hands of such men as Quetelet, Bertillon, Engels, Von Mayr, Edgeworth (to whom should be added from other sciences Galton, Venn, Karl Pearson, etc.), that the technique of quantitative induction constitutes in reality a new branch of science. (See STATISTICS.) Deduction in its quantitative aspect gives rise to the mathematical method of political economy, which at present is employed to a greater or less extent in all branches of economic theory, particularly in the investigation of prices, incidence of taxation, etc.

See FINANCE; FREE TRADE; INTEREST; INTERNATIONAL TRADE; LABOR, LAISSEZ-FAIRE; MERCANTILISM, PHYSIOCRATS; PROTECTION; RENT; SOCIALISM; SOCIOLOGY; TRADE-UNIONS; USURY; UTILITY; VALUE.

Bibliography. General: Adam Smith, *Wealth of Nations* (London, 1776, many later editions); J. B. Say, *Traité d'économie politique* (Paris, 1803; 7th ed, ib., 1861); David Ricardo, *Principles of Political Economy and Taxation* (London, 1817; ed. by F. C. K. Gonnor, ib., 1895); T. R. Malthus, *Principles of Political Economy* (ib., 1820; 2d ed, ib., 1836); J. S. Mill, *Principles of Political Economy, with Some of their Applications to Social Philosophy* (ib., 1848, ed. by W. J. Ashley, New York, 1909); J. S. Nicholson, *Principles of Political Economy* (3 vols., ib., 1897-1901); Maffeo Pantaleoni, *Pure Economics*, English translation by T. B. Bruce (ib., 1898); Henry Sidgwick, *Principles of Political Economy* (3d ed, ib., 1901); T. N. Carver, *Distribution of Wealth* (ib., 1904); Karl Marx, *Capital: A Critique of Political Economy* (3 vols., Chicago, 1906-09); R. T. Ely, *Outlines of Economics* (rev ed., New York, 1908); Alfred Marshall, *Principles of Economics* (6th ed., ib., 1910); Henry George, *Progress and Poverty* (25th anniversary ed., ib., 1912); William Smart, *Distribution of Income* (2d ed, ib., 1912); W. S. Jevons, *Theory of Political Economy* (ib., 1912); Irving Fisher, *Elementary Principles of Economics* (3d ed., ib., 1912); H. R. Seager, *Principles of Economics* (ib., 1913); Benedetto Croce, *Philosophy of the Practical: Economics and Ethics*, English translation by Douglas Ainslie (London, 1913); Bertrand Nogaro, *Éléments d'économie politique* (2 vols., Paris, 1913-14); Ely and Orth, *Property and Contract in their Relations to the Distribution of Wealth* (2 vols., New York, 1914); E. R. A. Seligman, *Principles of Economics* (6th ed., ib., 1914); Frederick Mathews, *Taxation and the Distribution of Wealth* (ib., 1914); Charles Gide, *Political Economy* (Boston, 1914); F. W. Taussig, *Principles of Economics* (2d ed., 2 vols., New York, 1915); G. P. Watkins, *Welfare as an Economic Quantity* (Boston, 1915). History: August Oncken, *Geschichte der Na-*

tionalökonomie (Leipzig, 1902); J. K. Ingram, *History of Political Economy* (2d ed., New York, 1909); James Bonar, *Philosophy and Political Economy in Some of their Historical Relations* (ib., 1909); L. H. Haney, *History of Economic Thought* (ib., 1912); F. A. Fetter (ed.), *Source Book in Economics* (ib., 1912); W. J. Ashley, *Economic Organization of England: An Outline History* (London, 1914); Gide and Rist, *History of Economic Doctrine from the Time of the Physiocrats*, English translation by R. Richards (ib., 1915). Encyclopædias, etc.: Adolf Wagner, *Lehr- und Handbuch der politischen Oekonomie* (4 vols., Leipzig, 1883-1901); Léon Say, *Nouveau dictionnaire d'économie politique* (2d ed., 2 vols., Paris, 1900); J. J. Lalor, *Cyclopædia of Political Science, Political Economy, and Political History of the United States* (3 vols., New York, 1904); R. H. I. Palgrave, *Dictionary of Political Economy* (3 vols., ib., 1910-13); Hubert Hall, *Select Bibliography for the Study of English Mediæval Economic History* (London, 1914).

POLITICAL OFFENSES. Acts that are considered injurious to the safety of the state in its political capacity or that involve a violation of the allegiance due from a subject or a citizen to the supreme authority of a nation. Such offenses are distinguished from ordinary crimes which disturb the public peace (as murder, theft, arson) but are not directed against the government. On the assumption that persons arriving from foreign countries after the commission of a political offense have been actuated by motives of patriotism, they are now received as refugees and protected in the more progressive countries, especially in England and the United States. For protection in legations, see *ASYLUM*, *RIGHT OF*. Offenses of a political nature are almost always excluded by the terms of extradition treaties. The tendency in modern times is to deal leniently with political offenders. Although treason is nominally punishable with death in most countries, the sentence is now usually commuted to life imprisonment. See *CITIZEN*; *EXTRADITION*; *GOVERNMENT*; *TREASON*.

POLITICAL PARTIES. Voluntary associations or organizations of citizens for the attainment of desired ends or policies through united political action. They are found in all democratic states and all countries governed upon a constitutional basis, and are a necessary accompaniment of popular government, although in recent years direct political action through the medium of the initiative, referendum, and recall, and the growing influence of the independent vote, have in a measure weakened the control of parties. English-speaking nations have shown the greatest aptitude for party organization, and generally the two-party system has obtained. The theory and general practice of parties among the Latin and other peoples that have followed the English race in the adoption of representative government are the same, although race characteristics and lack of training for self-governing institutions have modified the party system in actual practice among these peoples. In these countries there is a tendency of parties to split up into factions or groups, advocating more or less separate and distinct ideas. The political groups in France and Spain illustrate this tendency. Governments are supported by combinations of groups or *blocs*—a word first used by M. Clemenceau—and their

alignment is changeable. Each of the great parties in the United States and in Great Britain stands for a number of principles, to all of which its members may not agree, whereas under the plural party system this anomalous loyalty is not required nor does it exist.

Aside from local and temporary issues, there are certain natural lines of cleavage in political society which have an influence in the composition of parties. The division between conservative and radical, with all the intermediate gradations of belief, is as old as society and underlies nearly all parties that are not mere personal factions. In the political philosophy of the world the nice balance between the conservative spirit that clings to that which is sanctioned by established usage and the radical, progressive, or liberal spirit, which seeks modification of the old in the interest of progress, is most desirable. This end is somewhat imperfectly attained by the opposition of parties representing in some form the two ideals. This is the broadest and most universal idea that divides parties. In England, where the highly developed parliamentary government makes for strong party organizations, they form almost a part of the government machinery itself, and have their chosen and officially recognized leaders by whom the party policy is voiced and directed. In other countries, although their influence upon the government is as important, their connection with it has less of an official character. Below is given a summarized account of party relations in the various European countries, Canada, China, and Japan. Political parties in the United States are described under their historical names, as *DEMOCRATIC PARTY*; *PROGRESSIVE PARTY*; *REPUBLICAN PARTY*; *WHIG PARTY*; *ETC.*

Austria-Hungary. The strong national feeling on the part of different peoples embraced in the Dual Monarchy and the peculiar constitution of the Empire have aligned parties during the nineteenth century chiefly upon race lines. In the Empire there are 10 great nationalities, with subdivisions amounting to 26. These are mutually jealous and antagonistic, and this fact determines the policy of the Imperial ministry, which is, in general, to create its own party support by combining different race groups against the others. These alignments are by no means permanent or stable. After the revolutionary movement of 1848 a period of absolutist reaction set in, which suppressed all political life for 10 years. In 1861, after the failure of an attempt to reorganize the Empire on a federalistic basis, the government proceeded to establish a constitutional system upon a basis of consolidation. In this reconstruction the aspirations of the Magyars were all but completely ignored. During the period between 1860 and 1867 the so-called Federalist party stood for conservatism in its strictest sense, and party government as distinguished from the Imperial policy can hardly be spoken of. After a suspension of the constitution the Compromise of 1867 (see *AUSGLEICH*; *AUSTRIA-HUNGARY*) was arranged, establishing the present dual system. Under it party contests in Cisleithania became more pronounced. The Germans divided into several groups, such as German Nationalists, Clericals, Progressives, Radicals, Agrarians, Social Democrats, and Christian Socialists. The Socialists (83 in 1911) represent, as in Germany, in great measure the aspirations of the

liberal elements, and the spread of their political faith has encouraged a tendency to disregard racial and provincial lines. This tendency, however, has not been successful; for in 1911, in the Reichsrat, there were only 23 Independents out of 446 not identified with some race. Christian Socialism (73 in 1911) has become but another name for the rampant party of anti-Semitism. Of late the anti-German attitude of the Roman Catholic clergy has given impetus to the so-called *Los-von-Rom* movement, which has driven thousands of liberal Germans in Lower Austria, Bohemia, Moravia, Silesia, and Styria into the fold of Protestantism and Old Catholicism. The nationalist groups or parties are the Czechs, Poles, Ruthenians, Slovenes, Italians, Croats, and Rumanians. Of these the most important are the Czechs. This group has its aristocratic and democratic wings, the Old and the Young Czechs, who have united in recent years in a demand for the recognition of the Czech nationality through a union of Bohemia, Moravia, and Silesia as a kingdom, united with Austria only by treaty, as Hungary is, and not organically. The Austrian Slavs, with the exception of the Poles, are very friendly to Russia, while the liberal Germans naturally lean towards Germany. These are united with the Magyars of Hungary in common fear of Slavic domination. A reform bill passed in 1907, by Baron Beck, provided for universal manhood suffrage to those over 24 years of age, and the immediate result was to give the Slavs a majority of the seats in the Reichsrat, and to show that, apart from nationalities, the Social Democrats and Christian Socialists were the strongest single parties. For Hungary (Transleithania), see *Hungary* below. While Austrian party history has been concerned chiefly with conflicts or race, those races have severally disintegrated into cliques. In the elections of 1911 there were 51 parties in the field, each having a separate organization. Between 1897 and 1907 there were periods of prolonged deadlocks in the Reichsrat over the language question, each race contending that its language should be utilized at public functions and by the army recruited from its citizens.

Balkan States. In the Balkan states—Bulgaria, Rumania, and Servia—pro-Russian and anti-Russian sentiment formerly had a principal share in the alignment of parties, especially in Bulgaria. In Bulgaria, before the union with Eastern Rumelia (1885), there were Radicals, who demanded union, and Conservatives, who were satisfied with the existing condition. After the union, in the face of Russia's bitter opposition thereto, the Radicals became anti-Russian. The Bulgarian Nationalists sought to unite all Macedonia under Bulgaria, and therein Bulgaria's interests clashed with those of Greece and of Servia. The Nationalists supported the Balkan War of 1912-13 (q.v.) and inspired the intervention of Bulgaria in the Great War in 1915; their only serious opponents were a small but growing group of Social Democrats. Rumania, of all this group of states, is the most settled in its political life. The major parties are Conservatives and Liberals, the government is of the parliamentary form, and these two parties have alternated in the ministry; in late years Rumanian politics have been complicated by the appearance of two new groups—the Agrarians, an offshoot of the Conservatives, and the Socialists, a radical element of the

Liberals. In Servia the parties are Liberals, who are pro-Russian; Radicals, also pro-Russian; and Progressists, whose former tendency to lean to the side of Austria in political matters has been supplanted since 1908 by a strictly nationalist tendency combined with many projects of social reform. For actual political conditions in the Balkan states, see *BULGARIA*; *MONTENEGRO*; *RUMANIA*; *SERVIA*.

Belgium. The chief parties are three—Clericals or Catholics, Liberals or anti-Catholics, and Socialists—and there is in addition the group of Christian Democrats. Until 1847 there was a struggle against the crown to establish party government through a responsible ministry. Since that year the ministry has been taken from the majority in the Chamber of Deputies. The parties have alternated in control, but since 1884 the Catholics have held the government and have gathered to themselves the conservative elements of society repelled by the growing political importance of the Socialists. In 1893 an active agitation resulted in the adoption of universal suffrage, combined with plural voting by those who had certain property and educational qualifications. Since that time the Liberal party has acted in close coöperation with the Socialists. The elections of 1902 gave the Clericals a majority of 24 in the Crown Chamber. This majority was gradually reduced at subsequent elections until in 1910 it was only 6. But when, in 1912, the Liberals and Socialists went before the country with a programme to abolish both state support to denominational schools and plural voting, the Catholic majority in the Chamber was increased to 18; and the attempt in 1913 to force the adoption of the same measures by a general strike of all manual laborers was likewise unsuccessful. In 1914, when Belgian territory was largely occupied by German forces, the seat of government was moved to Havre, France, where the political life of the nation was resumed.

Canada. Political parties were first effectively organized after the War of 1812. Aroused by the political monopoly and social arrogance of a group of Tory officials and families known as the Family Compact, opposition in Upper Canada took the shape of a Reform or Liberal party which demanded responsible government. Its leaders were William Lyon Mackenzie, Robert Baldwin, John Rolph, and Marshal Spring Bidwell (q.v.). The Liberals of Lower Canada, led by Papineau, also began to contend for increased popular rights. Rebellions in 1837-38 gained a partial victory for reform in both provinces, and this was followed by the mission to Canada of Lord Durham, on whose famous report was based the Act of Union (1841). The struggle for responsible government was renewed in the Province of Canada created by the Act of 1841. Also new dangers appeared in the racial and religious solidarity of the French Catholics of Lower Canada, who feared that the demand for representation by population made by the British in the sister province was intended to prejudice French influence in the Legislative Assembly. About 1849 new party alignments were evident. Moderate English-speaking Liberals, led by Baldwin and later known as Baldwin Reformers, drew away from the more advanced section of the party and were largely absorbed by the Liberal-Conservative (commonly called Conservative) party, organized by Sir John A. Macdonald to supersede reaction-

ary Toryism. The advanced English-speaking Liberals were organized as the Clear Grit party, with a radical reform programme resembling Chartism (q.v.). Among its leaders were Peter Perry, John Rolph, and, later, Malcolm Cameron (qq.v.). In Lower Canada arose the Parti Rouge, or the Rouges, with principles similar in some respects to those of the Clear Grits, but even more radical in others, including the repeal of the Act of Union and the advocacy of a republic. Papineau was its leader, and among his associates were A. A. Dorion and Luther H. Holton (qq.v.). Neither the Clear Grits nor the Rouges gained a permanent place, both being gradually displaced and dissolved by political deadlock of the two provinces and by the necessities of the movement for Confederation which resulted in 1867 in the formation of the Dominion of Canada. This compelled another readjustment of parties. George Brown, who was hostile to the Clear Grits, had already brought back the rank and file of the Liberals under one banner, and the Rouges had moderated their programme. But Confederation, which marked off specified provincial rights from the residuum of unspecified federal or national rights, likewise compelled a dual system of parties, federal and provincial, the old names of Liberal and Conservative being retained. Variations thereof by parties organized for special or temporary issues are referred to in the article on PARTY NAMES.

After 1873, in Dominion politics, the Liberal and Conservative parties practically held the field, the former leaning to free trade, though restricted in practice to a moderate revenue tariff in 1873-78, the latter establishing a protective policy in 1879. As regards federal and provincial rights neither party could be said to be wholly aligned on either side, though the Conservatives emphasized federalism and the Liberals in notable instances sustained provincial rights. During the Laurier régime of 1896-1911 the protective policy was not seriously disturbed. In 1911 the Conservatives regained power by their opposition to the Taft-Fielding reciprocity agreement, although at various times they had themselves favored reciprocity with the United States. Thus under the guise of traditional forms the two parties were largely opportunist. See CANADA, *History*; also histories of the various provinces.

China. Political parties in the modern sense can scarcely be said to have developed in China, despite the formation of the republic. For the parties existent before 1912, see CHINA. In republican China there were at first two main party divisions with many subdivisions. The Conservatives and moderate Republicans, together with many Imperialists, were led by Yuan Shi-k'ai. The Radicals, or Kuo Ming Tang, an outgrowth of the old Tung Meng Hui and Young China parties, were led by Sun Yat-sen, Li Yuan-hung, Chen Chi-mei, and Huang Hsing, and demanded a liberal constitution, reform, and Western culture and science. Somewhat similar to this division was that between the Pekingese party of the North and the Cantonese party of the South. The revolution of 1911-12 resulted in the overthrow of the Empire and the partial victory of Kuo Ming Tang, but the Constitutional Assembly was dissolved by Yuan Shi-k'ai before the Radicals could carry their programme. A powerful reaction of sentiment occurred in the country, the President

practically dissolved Parliament, the leaders of Sun Yat-sen's party fled from China, and the Conservatives were left in control. In 1915 the Council of State voted to return to monarchy. The throne was offered to Yuan Shi-k'ai (q.v.), who accepted it. Consult *China Year-Book*.

Denmark. Parties in Denmark took on a new formation after the cession of Schleswig-Holstein and Lauenburg in 1864. Under the constitution of 1866 the Diet was composed of two chambers—the Folkething, the popular representative branch, and the Landsting, consisting of 12 members appointed by the King and 44 elected by voters possessing incomes of 2000 crowns. The Liberal-Nationalist party, which had opposed the cession of the duchies, became a conservative landholding and official class party, controlling the Landsting, while the masses, represented in the Folkething, stood in opposition. Their representatives, the various radical groups, drew together as the United Left, but composed chiefly of the Moderate Left and the Democratic Left. An endless dispute after 1872 arose over the budget between the Houses, the Democratic Left, controlling the Folkething, refusing to admit the veto of the Landsting. Despite this opposition the Conservatives under Jacob Estrup held office from 1875 to 1894. He employed the Bismarck expedient of appropriating funds by royal ordinance. The cabinets were of a conservative character and in hostile relations with the Folkething until 1901, when a Liberal ministry was organized by Deuntzer. He resigned in 1905, but the Liberal policy was continued until 1909, when the influence of the Radicals and Socialists increased. There ensued a period of ministerial instability. In 1913, however, Premier Zahle formed a strong cabinet from the Left.

France. The French Revolution, by the impulse that it gave to the growth of democracy, introduced political parties in continental Europe (See FEUILLANTS; GIRONDISTS; JACOBINS.) With the Restoration there appeared the two monarchist parties—the Constitutional Monarchists and the Ultra Royalists. (See CHAMBRE INTROUVABLE.) There were also the Doctrinaires, Republicans, and Bonapartists. With the accession of the house of Orléans in the person of Louis Philippe, French parties underwent a readjustment. The existing monarchy was opposed by Legitimists, who sought the return of the elder Bourbon line; Bonapartists, who would have restored the Napoleonic régime; and Republicans. The Orleanist monarchy was overthrown, by the Republicans and Socialists (see FEBRUARY REVOLUTION), but the Bonapartists became dominant after the coup d'état of Dec. 2, 1851. (See NAPOLEON III.) From 1852 to 1860 the Emperor exercised almost autocratic power, and politics were dormant so far as popular parties and parliamentary life were concerned. Later he lost the support of the Catholic clergy by his Italian policy, and was compelled to turn more to the Liberals. He thus reopened the active political life of France. Republicans, Orleanists, and Legitimists at once formed an Opposition. Parliamentary action was renewed. A Liberal Imperialist party supported the Emperor, but opposed his ministers. Upon this party Napoleon depended to maintain the Empire against the Royalist and Republican coalition in 1869-70. The French defeat in 1870-71 (see FRANCO-

GERMAN WAR) overthrew the Empire and presented the Republicans their opportunity. When the Third Republic rose upon the ruins of the Second Empire, the Republicans, although a minority party, were able to control affairs through the lack of harmony among their opponents. Each of the three monarchical parties—Legitimists, Orleanists, and Bonapartists—recognizing its own inability to control the situation, was willing to have the Republicans temporarily in power, hoping that the next turn of the political wheel would bring in its own particular type of monarchy. In the first National Assembly the Royalists and Bonapartists made up the reactionary Right and, united, were in a majority, while the Republicans themselves were made up of numerous and often discordant groups. There were the Extreme Left, which had few members but a large following outside the Assembly; the Left, by far the largest group; and the conservative Left Centre, which gradually gained supporters among the moderate or constitutional Monarchists of the Right Centre. The ministry was a conservative one made up from the Left Centre. The acceptance of this moderate leadership was an encouraging sign, but all unity disappeared as soon as the German occupation ended. During this period the leadership of the radical parties was weak and incapable because of the exile of the principal chiefs after the Commune movement. The Radical strength in the Chamber increased slowly, and in response to its demands the ministry was modified. The united Right was able to pass a vote censuring the change in the ministry, and Thiers resigned, whereupon Marshal MacMahon (q.v.) was elected President as the candidate of the Right (1873). He at first appointed a coalition cabinet from the three monarchical parties. The Right was united only in opposition to the Republicans, and the groups of the Left likewise united solely for the purpose of opposing the government. For a year and a half the different aims of the factions on both sides of the Assembly prevented action on the Constitutional Laws. (See FRANCE.) In June, 1875, fearing the growth of the Imperialist strength, some of the constitutional Monarchists united with the Left to secure the passage of the laws.

The Assembly created by the new constitution consisted of a Senate and a Chamber of Deputies. The Republicans, with a large majority in the Chamber, forced the fighting; and after 1882 they secured a majority in the Senate. They were divided into the Left Centre, Republican Union (the largest group, led by Gambetta), and the Radical Left. The Monarchists, adopting a conservative attitude, were grouped as Right Centre, Right, and Popular Appeal. MacMahon in 1876 made up a ministry from the Left Centre, at first under Dufaure (q.v.), later under Jules Simon (q.v.). In 1877, after a year of struggle against radical measures, acting under the advice of his conservative friends, MacMahon dismissed the Simon ministry, adjourned the Chamber, and then, with the consent of the Senate, dissolved it. The Conservatives then sought to intrench themselves in the government through the power given to the President and Senate by the Constitutional Laws, but the President had by his course opened a bitter struggle which destroyed any possibility of harmony. The Republicans won the elections, refused to recognize a Conserva-

tive ministry, and finally forced the President to form a ministry from the Left Centre. In 1878 the Republicans obtained a majority in the Senate, and MacMahon resigned in 1879, and was succeeded by Grévy. Their supremacy once established, the Republicans renewed their factional struggles. The Left Centre lost its influence. Gambetta's Republican Union was opposed by a growing Radical wing, which reproached Gambetta with opportunism. A series of ministries tending towards radicalism followed. A period of personal politics was entered upon, with ministries combined for expediency rather than as exponents of political principles, 14 different ministries holding office between 1878 and 1888. The two principal wings of the Republicans came to be known as Opportunists and Radicals. The Legitimists united with the Orleanists in 1883, and two years later an increased number of Monarchists were returned to the Chamber. An attempt was made in the face of this growing Conservative strength to unite the Opportunists and Radicals (policy of Republican concentration; the opposite being that of pacification, the alliance of one or more Republican groups with the Conservatives). The pretenders to the throne were banished in 1886 at the instance of the Concentration ministry. In 1887 the Rouvier ministry adopted the so-called policy of pacification. In the same year General Boulanger (q.v.) came into prominence and sought to profit by the prevailing political confusion. His shibboleth, "revision of the Constitutional Laws," won support from all the dissatisfied factions. His party was known as the Revisionist or National party. The support of Boulanger by the Catholic Conservatives alienated his Radical followers, who joined the Opportunists to defeat him. In 1889 the complete overthrow of this political adventurer was accomplished.

A marked change in parties now began. The Republicans who had united to defeat Boulanger continued to act together as Moderates or Government Republicans, and for a time homogeneous ministries were tried, such as that of Bourgeois and Méline (qq.v.). The monarchist parties were all weakened and discredited by their participation in the Boulanger episode. Radicalism came to be more and more represented by the Socialists. This body, hitherto of slight importance, had its origin in the break-up of the Republicans during the struggle against the July Monarchy, those who continued to uphold Republican principles seeking a purely political revolution, while a party of workingmen and theorists sought to make the Republic a means of radical social reform. In 1890 there were four Socialist groups, with views more or less extreme, and increasing political activity. The Socialists broke away from the Radicals, and in 1893 secured 50 seats. A change that greatly strengthened the Moderates was the gradual cessation of clerical opposition to the Republic. Many Catholics who had formerly acted with the reactionary parties now came to the support of the government under the name of *Kalliés*, or the Constitutional Right. There was very little positive legislation during this realignment of parties, and the Freycinet ministry (1890-92) enjoyed a hitherto almost unprecedented term of office. In 1892 there was a startling exposure of the use of enormous corruption funds in promoting the Panama Canal scheme. Over 100 Senators, Deputies, and

officials were implicated, including many political leaders, but even in the face of this the Moderates gained largely in the elections of 1893. The policy of concentration was discarded, and the Moderates took full responsibility, with Casimir-Périer (q.v.) at the head of the ministry. The murder of President Carnot in 1894 was followed by the election of Casimir-Périer as his successor and drastic measures against anarchists. The new President and his government were violently assailed by the Socialists and Radicals for their policy, the Dupuy ministry went down in 1895 before the Opposition attacks, and then Casimir-Périer resigned the presidency. Félix Faure (q.v.) was elected President by a union of the Moderates and the Right, but the Socialists, who had supported Brisson, had shown a significant increase of strength. The first Moderate cabinet (Ribot) gave way in a few months to one much more Radical (Bourgeois), but the latter, after a struggle with the Senate, was succeeded in 1896 by another Moderate ministry (Méline). The Dreyfus case (see DREYFUS) complicated French politics for three years and even endangered the Republic. The Méline ministry, which depended on the support of the Right, came to an end in 1898. A Radical ministry under Brisson wrestled unsuccessfully for a few months with the Dreyfus case. A new coalition cabinet was then organized by Dupuy. On the death of President Faure, in February, 1899, Emile Loubet (q.v.) was elected to the presidency, and in June a new ministry was made up by M. Waldeck-Rousseau. With this event, the recent *bloc* system was inaugurated in the form of an alliance of Radicals and Socialists. A Radical Socialist, M. Millerand, was included in this cabinet. The government took positive measures to put down the revived Nationalist agitation, imprisoning several of the old Boulangists, who had resumed their activity. An amnesty bill in 1900 purged all who were connected with the Dreyfus case. While the government thus tried to still the strife which had injured France, it did not hesitate to bring on a conflict with the Catholic church. This was done by the introduction of the so-called Associations Bill, regulating the privileges and rights of property of certain associations. This measure, while general in its terms, was ostensibly intended to bring within control of the common law the Jesuits and monastic communities, which had no authorization from the state, held large amounts of property, conducted numerous schools, and were directed to a great extent from outside of France. The measure was carried by a good majority in March, 1902. In the April election 382 Ministerialists and but 196 of all the opposition factions were returned. The Premier retired and was succeeded by M. Combes. In 1904 the Combes ministry brought in a bill for the separation of the churches from the state. (See FRANCE.) The Combes cabinet was overthrown in January, 1905. Rouvier headed a ministry which continued the policy of its predecessor and carried through the Separation Bill in December, 1905. Rouvier was defeated in March, 1906, and was succeeded by Sarrien. In the general elections of May, 1906, the government *bloc* won 411 seats, an increase of 58, and the opposition 174. The parliamentary session of 1906 witnessed the rise of conflict between the Socialists and their erstwhile allies. M. Clemenceau suc-

ceeded Sarrien in October, 1906, and his premiership, lasting until July, 1909, was the longest since the establishment of the Third Republic. Even then defeat was mainly personal, arising from criticisms of the naval administration. His policy was frankly socialist, with government ownership of certain railroads, graduated income tax, and anti-clericalism. Five members of his cabinet were continued under his successor, Briand, a Socialist. Briand's vigorous and patriotic opposition to strikers in the wine district and among the government telegraph employees weakened Socialism, and the government *bloc* showed signs of breaking up. His ministry resigned in 1911 because of differences respecting electoral changes and labor legislation. The Monis and Caillaux governments followed, the latter being overthrown in connection with the Morocco negotiations with Germany. In 1912 Poincaré formed a strong, moderate ministry which carried through the proportional representation law. On Poincaré's election as President in 1913 Briand formed a short-lived ministry. Several cabinets were formed thereafter, and fell because of inability to pass labor legislation, until in 1914 Viviani, a moderate Socialist, was selected. The Great War then caused a practical cessation of factional politics. As the war continued, however, much sentiment developed for a coalition cabinet, formed of the strong men of all parties. When complications arose in the Balkans and because of the impasse at the Dardanelles, the Viviani government was considered responsible partly for the entry of Bulgaria on the side of Germany and the neutrality of Greece. In October, 1915, Viviani resigned and Briand was requested to form a government. His cabinet included such men as Freycinet, Viviani, Combes, Ribot, Doumergue, and Bourgeois.

Germany. The national parties in the German Empire have their source and their local counterparts in the separate German states. Bismarck carried his earlier measures by means of the support of a patriotic nationalist party, the National Liberals, whose chief idea was the creation of German unity and who were willing to support the Chancellor. He was also supported, with more enthusiasm, by the Free Conservatives (*Reichspartei*). He was opposed by the Old Conservatives, who clung to the old particularistic régime, and by the Progressists (*Fortschrittpartei*), who rejected all compromises and were the radical wing of the Nationalist party that preceded the formation of the Empire. The Kulturkampf (q.v.) encouraged the growth of another strong opposition party, Ultramontane Catholic, known as the Centre. This had its strength in the Catholic states of south Germany and in the western part of Prussia. From 1893 to 1912 it was the strongest group in the Reichstag. But while the number of its seats in that body decreased from 103 in 1907 to 93 in 1912 those of the Social Democratic party, led by Liebknecht and Bebel, increased from 53 to 110 during the same period. Then came the National Liberals (44 in 1912), Conservatives (43), Radicals (42), Poles (18), Imperial party, progovernmental (14), Industrial Unionist (10), Alsatians (5), Welfs (5), German Reform party (3), and German Farmers' Union (2). The Nationalist party, which supported the foreign policy but opposed the domestic programme, gradually weakened.

The predominance of Prussia in the Empire gives Prussian politics an overshadowing influence, and the Agrarians, who are primarily a Prussian landholders' party, opposed to the present commercial policy of the government and desirous of extreme protection against the importation of foodstuffs, control the Conservative members entirely, the Centrists to a great extent, and have a strong hold among the Poles and Anti-Semites. The government is thus forced, on some of its favorite projects, to look to the Liberal groups for its support. The Agrarians defeated the Emperor's Rhine-Elbe canal project in the Prussian Landtag in 1899, arousing thereby bitter feeling. This strong Agrarian agitation is a most important complication in the already complex party situation in Germany. With the adoption of a colonial policy, a protective-tariff system, and the advent of William II, most of the old issues were gradually dropped and those of economic and commercial development, imperialism, and *Weltpolitik* were substituted. A *bloc* of Conservatives and the Centre supported Chancellors Caprivi and Hohenlohe, while the Social Democrats clamored vainly for domestic reform. Defying the opposition groups, the government strengthened the army, built a formidable navy, developed a merchant marine, acquired colonies, and sought to increase the prestige of the Empire. This party emphasized the cultural efficiency of Germany. The question of ministerial responsibility was widely discussed, but was evaded by the government. In 1906 the old *bloc* dissolved, and Bülow formed an insubstantial one of Conservatives and Liberals. This broke up on the budget of 1908, and Bethmann-Hollwég re-formed the old "blue-black" *bloc* of Clericals and Conservatives. Although the opposition failed to reform the Prussian ballot, it succeeded in forcing the Kaiser to relinquish exclusive control of foreign affairs. Among the Socialists a great change had taken place. They adopted the so-called revisionist programme, modifying the extreme Marxist doctrines in the direction of practical political expediency.

Great Britain. The great political parties in Great Britain at the present time are the Conservatives or Unionists, the Liberals, the Irish Parliamentary or Nationalist party, and the Labor party. The Conservatives and the Liberals are the lineal descendants of the old Tories and Whigs, and although their political ideas are far more advanced than those of their predecessors, they maintain relatively the same attitude towards the questions of the day. The professed policy of the Conservatives is the maintenance of the Empire, the preservation of the constitution in its present form, the union of church and state, the general conservation of vested interests, and a strong imperialist policy. The Liberal party comprises the great majority of the Dissenters in England and of all the voters in Scotland and Wales, but it is nearly always in the minority in England itself. Its policy is one of abstention from foreign complications, economy in expenditure, and reform in the constitution. The Radicals, who form a wing of the party, desire disestablishment of the state church, manhood suffrage, free education, and are the most insistent upon the abolition of the House of Lords. The Liberal party was divided on the question of the South African War in 1899-1902. The whole party opposed it in the beginning, and agreed

in criticizing the conduct of the war by the government. But while the majority favored granting a liberal measure of home rule to the Boers, a Radical minority advocated the independence of the republics. The Nationalist or Irish Parliamentary party was founded mainly through the efforts of Charles Stewart Parnell (q.v.) and is composed entirely of Irish members. Until 1914 it subordinated all other issues to that of Home Rule (q.v.), together with the reform of the Irish land system and of Irish taxation, and is in favor of the establishment of an Irish Catholic university. It has acted with the Liberals since 1886, and violently opposed the Boer War. The Liberal-Unionists separated from the Liberals in 1886 on account of Gladstone's advocacy of Home Rule, and subsequently acted with the Conservatives, their leader, Joseph Chamberlain, becoming the most pronounced advocate of an aggressive foreign policy and of the unconditional subjugation of the South African republics. In the general elections for Parliament held in October, 1900, 334 Conservatives, 186 Liberals, 82 Home Rulers, and 68 Liberal-Unionists were returned. The general election of January, 1906, resulted in an overwhelming triumph for the Liberals, representing a formal government majority of about 350. The most significant outcome of the election was the remarkable growth of the Labor representation, which in 1900 was only 9 and which now ceased to act as a group of the Liberal party and assumed a party organization of its own. By 1910 the Liberal-Union party had ceased to exist, and the election of that year returned to the House of Commons 274 Liberals, 272 Conservatives or Unionists, 84 Irish Nationalists, and 42 of the Labor party. For the account of British politics since 1908 see UNITED KINGDOM and PARLIAMENT.

Greece. There has never been in Greece a division of the voting population into great parties on great political issues, but in modern Greece, as in ancient Greece, the grouping has been rather that of factional followers of some strong political leader. In the frequent change of its ministries Greece bears a striking resemblance to France and Italy, and, as in those countries, the change has very seldom meant a revolution in policy. For the greater part of the decade 1880-90 the so-called parties grouped themselves around two leaders, Tricoupis and Delyannis, from whom were derived the names Tricoupists and Delyannists. In the general election of 1890 part of the Delyannists—then the opposition party—broke away from their former political associates, and under the leadership of M. Rhalli formed a new party organization known as the Neo-Hellenic or Young Greek party. M. Tricoupis died in 1896, and the leadership of his faction fell to M. Theotokis. His followers, called both Tricoupists and Theotokists, represent the more conservative tendency in Greek politics. In 1901 a new political group formed about M. Zaimis, who became Premier in that year. After 1906 M. Venizelos, of Crete, became the dominant personality, and his diplomacy brought Greece a great victory in 1912 after the Balkan War. In 1915 he was anxious for Greece to join with France and England against Turkey, but the King refused. Venizelos resigned and appealed to the country. He was returned with increased majority over the Neutralists, and formed another cabinet, but resigned again at the request

of his King when troops of the allies were landed on Greek territory (October, 1915).

Hungary. Hungary presents the interesting example of a country with a parliamentary form of government in which a single political party retained uninterrupted control for upward of 35 years. This party was the Liberal party—the party of Francis Deák, Julius Andrássy, and Koloman Tisza, whose able leadership was a strong factor in its continued success. This sustained control was due to the skillful electoral qualifications whereby the Magyars, although only 45.4 per cent of the population, were enabled to retain office. During the rule of the party of Deák, which began with the successful passage of the *Ausgleich* of 1867 and lasted until 1875, the opposition consisted of a party of radical Magyars who refused to accept the compromise, but who were in all other respects Liberals, and of a small group of Rumanians and Slavs whose opposition was racial. After Deák's withdrawal from public life in 1875 this radical Magyar party, under Tisza, who became Premier, united with Deák's followers to form the Liberal party, which continued in control until his death in 1902. The premiership of Tisza lasted from 1875 to 1890. During this period the principal opposition came from a small but earnest body of radicals known as Kossuthists, followers of the younger Kossuth, who contended that the only bond of union between Austria and Hungary should be the personal one of the sovereign. Although often having the opportunity, this party consistently refused office rather than serve under the *Ausgleich*. Stephan Tisza, a son of the great Premier, succeeded to the leadership of the Liberal party, and became Premier in 1903. The party was weakened by the secession of a faction led by Count Apponyi, and in the general election of January, 1905, was defeated by a coalition of Kossuthites or Independents and minor groups. After more than a year of bitter political conflict, in which the Independent majority refused to assume office except on the basis of broad concessions to the Magyar nationality, a ministry representative of all parties was formed under the premiership of Wekerle. In 1908 the government, in response to the insistent demands of the non-Magyar races, introduced an electoral bill which by its restrictions through plural voting and language tests made more certain the retention of control by the Magyars. Violent scenes occurred, a deadlock developed, and the ministry resigned. The Emperor sustained the demands for reform, but even this aid was ineffective; and Hungary in 1915 had the worst electoral system of all European countries. In 1910 Tisza organized the National Party of Works, which secured 255 seats in the elections of that year, and in 1913 he rose again to the head of the government.

Italy. There is no well-defined party organization in Italy, and such as exists is subject to rapid fluctuation in constituency and programme. For 15 years after the death of Cavour in 1861 the government was generally directed by a ministry from the Constitutional Right or Conservative side of the Chamber, but after 1876 the Liberal Left came into power and the Right almost disappeared. Such Radical ministries led by Rattazzi had urged the forceful completion of Italian unity. The Left has been largely dominated by Radical elements. Its

accession to power marked the domination of the southern Italians in politics and the era of personal groups or factions without other guiding principle than that of political or financial self-interest. The Radicals ruled from 1876 to 1896, and were led by Depretis, Crispi, and Giolitti. Gross irregularities, violent parliamentary sessions, and a cringing foreign policy characterized the period. From 1896 to 1915 there was a period of composite ministries and artificial groupings, dominated in turn by Giolitti, Sonnino, Luzzatti, and Salandra. There was practically no Conservative party, Giolitti being a Radical and Sonnino a Liberal. The Socialist party was ably led by Bissolati, who was a revisionist. In 1914–15 the country divided into Neutralists, opposing war, and those who favored entry into war on the side of the allies against Germany. Republican and Socialist groups have also played a part in Italian politics. A peculiarly Italian party is that of the Irredentists, who seek to unite with Italy the Italian portions of Austria, Switzerland, and France, or unredeemed Italy (*Italia irredenta*). A serious embarrassment in Italy since the union has been the abstention of good Catholics, under direction of the Vatican, from participation in politics until 1903, when a Catholic party was organized, which practically accepted present conditions. In 1913 it elected 24 members.

Japan. Political parties may be said to have developed after the promulgation of the constitution in 1889, which granted a representative legislature. The parties were based on the four clans, Satsuma, Choshu, Tosa, and Hizen. The first two were aristocratic and conservative and formed the basis for the *Seiyukai*, or Constitutional Political Association, organized by Marquis Ito in 1902; the last two were somewhat liberal and democratic and gave members to the *Fuyu-to* (Liberal) and the *Shimpo-to* (Progressive) parties respectively. The *Daido Club* was a conservative organization of business men; the *Boshin Club* offered radical principles; and the *Yushinkai* was independent and Socialistic. The Progressists, founded by Count Okuma, was the imperialistic party, seeking Japanese expansion. Political parties have not been well organized, but have been rather in the nature of clubs. In 1908, however, the *Seiyukai*, on a national platform, succeeded in defeating the *Daido Club* and in securing an absolute majority in the House of Representatives. It was thought that this success would result in effecting ministerial responsibility. The old system of appointment of the cabinet by the Emperor on advice of the *genro*, or committee of elders from the House of Peers, persisted, however, despite the grave political scandals of 1909 and 1912. Although unpopular, Premier Katsura remained in office from 1908 to 1910. Politics in Japan are somewhat personal, ministries are unstable, and late political history has been characterized by much venality and graft.

Netherlands. The history of political parties in the Netherlands has been an uneventful one, owing largely to the fact that during the greater part of the last half century the Liberals, consisting of Moderates and Progressives, have been in almost undisputed control of affairs. There have been, however, infrequent overturnings of their régime, brought about generally by a temporary coalition of the opposing group.

The most recent revolution of this sort took place in 1901. The Catholic party, together with its allies the Orthodox Protestants, has for many years formed the most compact and well-organized group of the opposition, but its refusal to participate in coalitions had rendered its opposition of little effect. The last few years, however, have been marked by a remarkable growth in the power of the Orthodox Protestant party or Anti-Revolutionists, who for some time were satisfied to take only a passive part in political affairs. This party finally effected a coalition with the Catholics, led by Kuyper, and in the elections of 1901 achieved a striking victory over the Liberals, who were weakened by dissensions and by a reputed alliance with the Socialists, who demanded universal suffrage. A Clerical Anti-Liberal ministry was formed in which the Catholics were given three portfolios. Other parties represented in Parliament are the Historic Christians, Radicals, and Socialists. From 1903 to 1909 the Liberals ruled and their tenure was colorless. In that year the Conservatives regained complete control.

Norway. See under that title.

Portugal. Between 1834 and 1852, the old Absolutist party having become extinct, the Liberals, who had successfully opposed the Absolutists, divided into two parties, the Chartists, who supported the strongly monarchist charter of 1826, and the Septembrists, who rallied around the popular constitution of 1822. A coalition of Septembrists and Chartists, known as Regenerators, took control of the government in 1852, but this coalition soon broke up and the Historic Left was formed from its remnants and merged in 1877 with a new Reformist party, as Progressists. The Regenerators now form the Right, or conservative section; the Progressists the Constitutional Left. There was also a small but active and growing Republican party, formed in 1881. The two great parties between 1877 and 1910 simply rotated in office. Politics were notoriously corrupt, and the Republicans were systematically prevented from holding office, although majorities were often returned for them. From 1906 to 1908 Franco, a determined reformer, was Dictator. His efforts only spurred the Republicans into greater activity. His work was undone, the King assassinated, and a period of political confusion ensued, terminating in the revolution of 1910, whereby a republic was established. Under it there developed the Radical, Socialist, and Monarchist parties.

Russia. Political parties in the modern sense of those participating in actual legislative processes date from the announcement of the Fundamental Law of 1905. (For parties which antedate this event, see GREEK CHURCH; Nihilism; RUSSIA; RUSSIAN LITERATURE; ETC.) The law establishing the Duma was announced on August 19 and that decreeing a fundamental law on Oct. 30, 1905. Most of the legally recognized political parties developed from approval or opposition to these manifestoes: the Octobrists, organized by Milutin and Shipóff, and the Nationalists supported them as being well suited to needs; the Right, composed of the Clerical reactionaries and the Conservative Democrats, opposed the fundamental law as giving much power to the Duma; the Left, composed of the Cadets or Constitutional Democrats, led by the distinguished historian Mil-

youkov, Progressists, Labor party, and revolutionary Socialists, opposed it as giving too little. In addition to these alignments there were parties based on race distinctions, there being 14 races represented in the third Duma. Secret organizations, such as the Okhrana or Secret Political Police and the Union of the Russian People, also exert powerful political influence. Under the liberal electoral law of 1905 a Duma was selected which gave the Cadets and the radical reform parties control. Count Witte, the author of the October manifesto, had been dismissed, and M. Goremykin was the Premier to meet the Duma. A deadlock almost immediately developed when the conservative ministry refused to adopt or even to discuss the radical and comprehensive reform programme of the Duma. Goremykin fell, and M. Stolypin, an able though stern constitutionalist, was made Premier. The Duma was dissolved and another elected in 1907, with the same parties in preponderance. In the midst of the great disorder and repression then existing the revolutionary parties severely criticized the government. It was alleged that members of the Social Democratic parties were in conspiracy against the Emperor, many were arrested, the Duma was dissolved, and some of the Socialists withdrew to Viborg to draw up a manifesto urging the people not to pay taxes. A new and complicated electoral law was announced by Imperial ukase (1907), whereby large elements of the radical parties were disfranchised and the control of the Duma was given to the wealthy landowners. Repression almost destroyed the leaders of the revolution. The third Duma met in 1907 and was controlled by the Octobrists and Nationalists, then in coalition. The leader of this group, Guchkov, who insisted upon conservative reform and a national programme for a Great Russia, was made President. In 1909 the Nationalists adopted a distinctly Slavophil policy with education, militarism, and Russification as features. In 1911 Stolypin, who had accepted the Nationalist policy, was assassinated and was succeeded by M. Kokovtsov. In the election for the fourth Duma, in 1912, the Clericals attacked the Octobrists with extreme bitterness, and that party suffered a defeat, losing its leader. The result was a victory for the Right, although the Centre and Left combined to elect the President, Rodzianko. In 1913-14 the Octobrists divided into factions, and the majority of the Duma became more conservative. Kokovtsov was dismissed in 1914 and Goremykin was returned to office. The Great War in 1914 effected a practical consolidation of parties in support of the government. For text of the fundamental law of 1905 and the later changes, consult Dodd, *Modern Constitutions*.

Spain. Spanish parties have been in a state of confusion ever since the beginning of the struggle for constitutional government. During the first third of the nineteenth century the struggle between absolute monarchy and constitutionalism brought into existence different parties maintaining all gradations of political opinion from absolutism to radicalism. After 1833 the dynastic parties of Carlists and Cristinos arose. (See CARLOS, DON; SPAIN.) There were also two Liberal parties—Moderates and Progressists. These parties disintegrated about 1850-51 and new temporary combinations were formed. The revolution of 1868, which

overthrew Isabella II, was followed by a struggle between Republicans and Monarchists, which, after the resignation of King Amadeus in 1873, resulted in the short-lived republic under Castelar. In 1874 the monarchy was restored, and in 1876 the new constitution gave opportunity for a new alignment. Under this there were two constitutional monarchist parties—the Conservatives, made up chiefly of the clergy and aristocracy, and the Liberals (Constitutionalists or Dynastic Left). In addition to these two true political parties were the Carlists, who were irreconcilable absolutists, the Republicans, and the Possibilists (a name having much the same meaning as Opportunists in France). The Republicans have an increasing strength in Spain. For many years Cánovas del Castillo and Sagasta, the respective leaders of the Conservative and Liberal parties, had been alternately in power. Just before the war with the United States Sagasta (q.v.) and the Liberals again took the helm. The peace negotiations brought the Conservatives once more into power but the administration was a troubled one. Since 1900 Spain has suffered from political instability, the ministries changing almost every year. The forceful leaders were Maura, the Conservative, and Canalejas, the democratic Liberal. The execution of the Liberal anarchist, Ferrer, and the Morocco crisis drove Maura from office in 1909 and the Liberals assumed power. The cumbersome electoral law, requiring candidates to be renominated by some member or ex-member of the Cortes or Senate tends to prevent the revolutionary parties from securing office. See SPAIN.

Sweden. The parties are the aristocratic Conservative party, forming the Parliamentary Right and having its strength in the cities, and the rural Democratic party, the Parliamentary Left, known as the Rustics. In recent years an urban Democratic party of decidedly radical tendencies has arisen. The Socialists, organized as a party in 1889, joined the Democrats and a demand was made for universal suffrage. The first purely Liberal cabinet was formed by Staaff, in 1905, as a result of events connected with the dissolution of the union with Norway. The issue dividing parties until 1907 was the electoral law. An Act was passed in 1909 granting manhood suffrage and proportional representation for the Lower House of the Riksdag. In 1912 a limited female suffrage was granted allowing women to vote for members to the Lower House. In 1914–15 the chief issue was military defense and increase of armament. The Conservatives advocated this programme and were successful. The Social Democrats made marked advance.

Switzerland. There is no party government in Switzerland and no party machinery such as is necessary in countries where there is party government. Minority representation is responsible for this. There are parties, however. The political history of the present confederation begins in 1847, when the Radicals triumphed over the Catholic Sonderbund. The most enduring political cleavage then and subsequently was centralism versus federalism, but this issue has lost most of its real significance. Liberals, Radicals, and Catholics were thereafter the parties that appealed to the suffrages of the people. The two former divided at first on the attitude of Switzerland towards the revolutionary movement elsewhere; then on railroad development

and other questions. In the struggle over constitutional revision from 1864 to 1874 revision was opposed by the Ultramontane Catholics and by the French and Italians, who feared the domination of the German cantons. After the revision there were new adjustments of party relations. The Vatican decrees of 1870 were opposed by a body of Swiss Catholics, who rejected the dogma of papal infallibility. They were known as Old Catholics, and their recognition by the Swiss government as the true Catholic body precipitated a contest with the Vatican and the Ultramontane Swiss Catholics. The Ultramontanes or Clericals, the legislative Right, became a strong and aggressive political body. On the other side the Radicals form the Extreme Left, believing in the absolute severance of both Protestant and Catholic churches from politics. The Radicals differ in their attitude on questions outside of Church matters, the French being opposed to the national centralization which is sought by the Germans. The Centre, or Liberal Conservative party, is far from homogeneous and united. It is made up mainly of the conservative moneyed classes. A Catholic People's party was formed in 1894. Socialist party movements, although many have been set on foot by foreigners who have found asylum in Switzerland, have not flourished on Swiss soil, but the Grütliverein, a society founded in 1838 on a democratic basis, has been gradually adopting Socialist ideas. The Liberals or Centre oppose paternalism and stand for individual rights. They comprise a large part of the wealthy classes. Parties have been remarkably stable and sudden fluctuations have been unknown. The Socialists have opposed the policy of military expenditures, and for a time suffered. For the advanced legislation, see SWITZERLAND.

Bibliography. General: F. J. Goodnow, *Politics and Administration* (New York, 1900); A. L. Lowell, *Public Opinion and Popular Government* (ib., 1913); P. O. Ray, *Introduction to Political Parties and Practical Politics* (ib., 1913); J. M. Robertson, *Evolution of States* (ib., 1913); W. B. Bizzell, *Judicial Interpretation of Political Theory* (ib., 1914). United States: J. P. Gordy, *History of Political Parties in the United States* (2d ed., 2 vols., ib., 1900–02); Jesse Macy, *Party Organization and Machinery* (ib., 1904); T. H. McKee, *National Conventions and Platforms of All Political Parties, 1789 to 1905* (Baltimore, 1906); M. I. Ostrogorski, *Democracy and the Party System in the United States* (New York, 1910); J. A. Woodburn, *Political Parties and Party Problems in the United States* (2d ed., ib., 1914); W. M. Sloane, *Party Government in the United States of America* (ib., 1914). Great Britain: T. E. Kebbel, *History of Toryism, 1783–1881* (London, 1886); W. H. D. Adams, *English Party Leaders and English Parties from Walpole to Peel* (2 vols., ib., 1878); Hilaire Belloc, *The Party System* (ib., 1911); A. W. Humphrey, *History of Labour Representation* (ib., 1912). Europe: A. L. Lowell, *Governments and Parties of Continental Europe* (2 vols., Boston, 1896; abridged and revised under title *Governments of France, Italy, and Germany*, Cambridge, Mass., 1914); Charles Seignobos, *Political History of Europe since 1814*, English translation by S. M. Macvane (New York, 1900); J. Peixotto, *French Revolution and Modern French Socialism* (ib., 1901); C. Grotewald, *Die Parteien*

des deutschen Reichstags (Leipzig, 1908-11); P. Penciocelli, *Le gouvernement parlementaire et lutte des parties en Italie* (Paris, 1911); Oskar Stillich, *Die politischen Parteien in Deutschland* (Leipzig, 1911). L. E. Jacques, *Les parties politiques sous la IIIe république* (Paris, 1913); F. A. Ogg, *Governments of Europe* (New York, 1913). For contemporary changes in parties and current politics, see yearly editions of *Annual Register* and *NEW INTERNATIONAL YEARBOOK*.

POLITICAL SCIENCE. That branch of the social sciences which deals with the organization and life of the state. It comprises the consideration of the general problem of the origin and nature of the state, investigations into constitutional forms, political forces, and modes of public administration, and the attempt to establish sound rules and maxims of political action. The characteristic feature of political and legal, as distinguished from purely social, facts lies in the presence, in connection with the former, of a definitely organized personal authority endowed with determinate functions and enforcing its decrees by a fixed sanction.

In the original Greek sense, "politics" refers to the entire art of realizing the ethical ideal in the state by the establishment and maintenance of orderly government, but in modern times this term is often used in a much more restricted sense. The characteristic political fact, according to the modern usage of language, is the struggle for personal authority in an organized community, as well as the struggle for the maintenance of the power of the whole state. The definite organization of power for the purposes of orderly government, the marshaling of popular support and of popular opinion, the creation of centres of control, and the defense of the entire structure of the state against attacks from without and from within—these constitute the characteristic problems of politics in the narrower sense. Whenever we deal with the dynamic facts of state life we therefore have primarily political considerations. This is the case in such subjects as diplomacy and international politics, party politics, and all the creative activities of the government. In this sense it is a political action to appeal to voters and to organize them into parties, to advance the candidacy of certain persons for office, to create a willingness for effecting changes in the law, or to obtain treaty advantages from foreign powers.

But state life may also be viewed as static—established in certain permanent forms and administered according to fixed rules. Here the conditions of political struggle for power and advantage are almost entirely eliminated and the state is looked upon as a commonwealth administered for the benefit of all citizens. The studies of public law (international, constitutional, and administrative), jurisprudence, and the technical methods of administration belong under this heading. They deal with state life as settled, as administered only by expert authorities and not immediately affected by the popular struggle for political power. By analogy this group of studies may be said to deal with the anatomy of the state, while the dynamic studies deal with its physiology.

Though the fundamental fact of political struggle will always remain the chief characteristic of politics, it must also be noted that the sphere of static institutions is constantly ex-

panding as the state develops in civilization. In the earlier ages the struggle for power swallowed up all available energies, and all considerations were subordinated to the political success of competing groups. Administration was viewed merely as the opportunity of the ruling group to fortify its position and to enjoy the fruits of power and influence. Even the "benevolent despotism" of the eighteenth century held that the chief reason why the prosperity of the lower classes should be protected was to maintain their value to the government as taxpayers. In an absolute monarchy the intrigues among contending factions seeking royal favor usually absorb the entire attention of the political classes, leaving but little to be devoted to the administration of the commonwealth. Now, although a system in which political struggle would be entirely eliminated is perhaps inconceivable, the ideal of a commonwealth demands that the ordinary administration of the state be placed as much as possible outside of the sphere of personal struggles for political power. For this reason the civil service should be rendered independent of political changes and an expert administration placed in charge of the current affairs of the commonwealth. Among the practical problems of politics at present there is none more important than the question as to how far the political representatives of the citizens—the parliamentary body—can profitably control and interfere with expert administration. While the sphere of parliamentary interference and control over the administrative departments may seem to be contracting, this is not to be taken as a sign of the absolute failure of parliamentary government, but as an indication that the development is towards a more perfect adjustment between the popular or political and the expert agencies in government.

Above the two aspects of political dynamics and statics, and embracing both, stands political theory or political philosophy, which deals with the general problem of the nature of the state. Viewing the state as a universal form of human association, it attempts to analyze the principles upon which its authority rests and according to which its functions are performed. Closely allied to it is the subject of political ethics, which tests the ideals of state forms and of political action. Among the Greeks these various aspects of political thought were not dissociated; politics was considered as the means of giving practical form and existence to the true ethical ideals. The Hellenic sense of concrete vision, however, guarded against a confusion of existing institutions with the ideal schemes of philosophical discussion. This distinction was not kept clear in the Middle Ages, and in self-defense the modern school of political science, following Machiavelli, has striven clearly to distinguish the actual from the ideal.

Purposes of Political Science. The primary purpose of political science is the understanding of the general laws of state life. This, however, does not involve the tracing back of political institutions to primal impulses in animal life and to dominant influences exerted by inanimate nature, a work which sociology and social psychology are attempting to do. Political science takes interest, motives, and purposes as it finds them, investigates their relations to one another, traces their mutual influence, and studies the political action and institutions created by them. Thus, in a modern state it will investi-

gate the grouping of interests in parties, observe the leading personalities who embody the purposes of large groups of men, and study the methods through which these purposes are expressed in legislation and realized through administrative action.

The second purpose of political science is the understanding of the forces, forms, and practices of contemporary political life. Although the aid of history is essential towards a thorough understanding of contemporary institutions, a minute analysis of their actual workings is equally indispensable in political science. This need not be purely empirical, but by the comparison of modes of action in various states a basis for scientific induction and generalization will be furnished. This purpose will therefore best be achieved by the combination of two methods—the detailed analytical study of institutional forms and administrative technique in any one nation and the comparison of the results thus obtained with institutions and practices in other states.

A third object of political science consists in the formation of political purposes and in providing a basis for political action. Far from involving merely a priori reasoning about human nature and about the actions proper to it, this pursuit is concerned with the establishment of practical conclusions upon the basis of wide and accurate information. In this aspect politics is an applied science—both normative and teleological—which determines the best mode of political action upon the basis of the most complete scientific information procurable.

Relation of Political Science to Other Fields of Knowledge. The relation of politics to the general science of society has already been indicated; its field is more restricted and the character of its methods teleological rather than causative. (See SOCIOLOGY.) The relation of politics to psychology also is that of a teleological to a causative science. All political institutions may be looked upon as psychological facts having their existence only in the mind, although they may be of the greatest tenacity and are in turn productive of concrete facts such as public buildings and improvements. But psychology, like sociology, is a causative science, going back of the purpose or concept with which politics starts and trying to investigate its psychic and physiological origins. The science of economics deals with a different set of social phenomena, which, however, have the closest bearing upon politics. Not only is political influence largely determined by economic power, but the constant interference of political agencies with economic interests and processes makes it necessary for political science to give special attention to economics. The field of history, like that of sociology, embraces political action together with the other manifestations of social life. But history differs specifically from politics in that its purpose lies in tracing individual chains of causation, whereas politics, by the use of the comparative method, establishes broader generalizations. The science of statistics furnishes a basis of induction for all the social sciences. Both in the study of the composition of political forces and of the results of political action regarded as experiments, the aid of statistics is indispensable. The knowledge of the material body and of the physical basis of state life is furnished by the sciences of ethnology and geography, the results

of both of which form the most essential data of political science.

Methods of Political Science. The scientific method of politics acquires its materials by the historic study of individual institutions, by the analysis of contemporary political life, by statistical investigation, and by the comparative study of institutions. On the basis of the facts thus secured it arrives by the process of induction at the general laws and principles of political action. The most distinctive features of this method are a sharp juristic analysis of institutions and the discovery of true analogies in different systems. By the application of this method the materials furnished by a number of auxiliary sciences are subjected to analysis and become the elements for a recomposition which results in a clear and definite grouping of social purposes in the form of political action. As the facts with which politics deals are much more definite than those of the general social sciences, and as political institutions and laws constitute, as it were, a precipitation of social forces endowed with great permanence and solidarity, the study of political development will always remain the backbone of historical work. Although we need not accept Freeman's dictum that history is past politics, it may be said that historical forces are most clearly understood, although perhaps not completely fathomed, when seen from the point of view of the growth and succession of political institutions and laws.

The principal methods auxiliary to political science are the historical, the statistical, the experimental, the analytical, and the deductive method. Political studies have always drawn their material chiefly from the recorded history of mankind, and are therefore assisted by the technique of the historical method—the critical scrutiny of documentary evidence and the mastery of the laws of cause and effect. But although politics, as indeed every other social science, has thus to make use of historical material, its problems differ distinctly from those of history. It is the function of history to explain a succession of events and actions through the discovery of a causal relation. The function of politics, on the other hand, is to explain a given institution through an investigation of its origins as well as through comparison with similar institutions elsewhere. To history all the transformations of a given institution are equally interesting; to politics, only those which explain its present character. Thus, in the study of the English parliamentary system of the present, political science need not give consideration to the original causes for instituting the British Parliament, as other causes have been substituted upon which the parliamentary régime is at present based. Therefore, in general, in a succession of substituted causes, political science would not go back of the causes directly operative in the institution to be explained, while to history the whole series of substitutions is important.

The statistical method furnishes much valuable and trustworthy material to political science, and for the knowledge of the physical body of the state statistics of population and detailed accounts of the economic products are indispensable. Similarly the effect of certain modes of legislation and of political action can best be tested by a study of their numerical results, such as, e.g., the operation of the liquor laws and of laws to foster agriculture, irriga-

tion, etc. But the more specifically political activities also may be approached by the statistical method, as when we study the attendance upon elections, the votes upon constitutional amendments, and the various groupings of political power. We must not, however, overlook the limitations of the quantitative method. An attempt to reduce political action entirely to quantitative form, and thus to trace it back to the working of physical causes, would result in failure, because the complex force of sentiment, sympathy, tradition, and other psychological factors cannot be quantitatively measured nor reduced with exactness to quantitative causes in the physical world.

Scientific experimentation is not possible in politics, because we cannot use a society purely as a subject of demonstration. Moreover, we have the opportunity to study the influence of any one cause by carefully excluding the operation of all others, as we may do in physical experiments. While, however, the scientific experiment pure and simple is by the nature of things excluded, practical experiments are constantly being made in politics, i.e., courses of action are tried without a knowledge of the exact results to be produced by them, but in the hope that certain improvements will be effected; as, e.g., in changes of the criminal law or in the methods of nominating and electing public officials. Such action, although not undertaken purely as an experiment, is experimental in the sense that the nature of its consequences can be definitely ascertained only through experience and that the action is undertaken with a knowledge of the possibility of varying results. Therefore, while politics as a science cannot set aside certain social factors for experimental purposes, as an art it is continually making experiments in practice, which in turn furnish the most valuable kind of material to scientific political study.

The importance of the analytical method has already been indicated above. As in the investigation of political and legal institutions the juristic bias is naturally very strong, there is constant danger in political science of resting satisfied with mere analysis of structural forms. A scientific method, while it must make use of the trenchant instrument of analysis, must also extend its range so as to embrace the real motive forces that lie back of institutional forms. The natural-law theory has always favored a purely juristic interpretation of institutions, and the scientific study of politics has been much retarded by the one-sided use of analytical methods leading to disputes over fine-drawn but unimportant distinctions, while apparent definiteness of the results obtained often causes men to overlook the powerful forces operating in political life.

The deductive method is thus explained by Professor Sidgwick in his *Elements of Politics*: "We assume certain general characteristics of social man, . . . and we consider what laws and institutions are likely to conduce most to the welfare of an aggregate of such beings." While this method is perfectly legitimate and has been fruitfully employed by most of the great political writers, it would be a mistake to suppose that it is the sole or even the principal reliance of scientific politics. In fact, if employed alone and unassisted by the study of concrete facts, it opens the door to hasty generalization and to the profitless expounding of threadbare theories. It takes on the subjective

coloring of the writer's mind and it does not in itself furnish a stable basis for the scientific pursuit of political investigation. Politics is made a science through the use of inductive processes. The careful study of political experience and of the ever-varying forces of political life provides the rich harvest of observation upon which general principles and maxims may be founded with a certain amount of warranted assurance; and though it may not as yet provide a large number of exact generalizations and rules for practice, it still is recognized as leading to a fuller mastery than does deductive reasoning, by giving the mind an insight into the wealth of incident and the dramatic action of politics. The deductive method is of value in the matter of applying knowledge to political action, when after a careful study of political forces and institutions their general nature and operation are understood. Such knowledge may then well be applied by a deductive process to concrete political action.

Branches of Political Science. In accordance with the general division of political science which has been indicated above, we may group the various branches of the subject as follows

Political Dynamics—

1. Diplomacy and International Politics
2. Party Politics.
3. Comparative Legislation
4. Governmental and Administrative Policies

Political Statics—

1. Constitutional Law
2. International Law.
3. Administrative Law and Technique.
4. Comparative Study of Institutions
5. Jurisprudence.

General and Normative Politics—

1. Political Theory.
2. Political Ethics

It would, of course, be impossible to deal with the living forces of public life without paying regard to the settled institutions, or, on the other hand, to investigate the latter without giving attention to the motive forces by which they are supported, and, no matter what subject in politics may be under consideration, generalizations belonging to political theory or ethics never can be excluded. While these various subjects are thus intimately interrelated, each of them nevertheless forms the centre for a group of specific considerations and preserves in the main its own point of view. But their mutual relations never should be overlooked. A study of the public law of any state without attention being given to political forces and their modes of action fails to convey a just conception of political life. In a state like the American Union, founded upon the theory of government by law deduced from a written constitution, static and juristic facts are often placed unduly in the foreground. The discussions in the American Congress are usually given a juristic turn, so that, e.g., the consideration of measures dealing with economic subjects like the trusts will be based primarily on constitutional arguments. The greatness of such statesmen as Lincoln consists in their knowledge of the true motive powers and in their readiness when necessary to modify juristic principles so as to adapt them to the living forces of politics—"to throw the Constitution overboard in order to save the Constitution." International law and diplomacy similarly bear a close relationship to each other. Not only is the former

largely a result of the efforts of the most enlightened diplomatists, but its enforcement is always conditioned by the actual grouping of the various factors in international politics. The study of comparative legislation furnishes materials to general jurisprudence, and this in turn enables the legislator to secure greater harmony and a more effective structure in his legal enactments. Practical politics, while primarily founded upon the grouping of interests, cannot afford to overlook the principles of political theory which pervade the thought of the people and give direction to their action and their enthusiasm. Political theory, on the other hand, should strive to be an expression of the cardinal facts of actual political life, and consequently the theory of democracy can no longer rest upon the original concept of an ideal state of nature. The intimate connection between practical politics and political ethics would not seem to need emphasizing were it not for the fact that certain writers, like Machiavelli, have dissociated political considerations from ethical principles, and also that in the practical politics of the lower type but very little application of ethical motives can be perceived. Even the details of administrative technique have a close connection with dynamic politics, for often a method of action that seems thoroughly convenient, and indeed almost necessary from the administrative point of view, may be subject to grave objections when the political life of the state is considered.

Literature of Political Science. It has been intimated with some truth that politics has not as yet fully made good its claim to rank as a science, because political literature lacks that succession of effort which constitutes the progressive element in the natural sciences. In the latter an investigator will take up the work where his predecessor has left off. In politics there has been no such development by successive, long-continued effort; any writer considers himself well qualified to contribute a valuable discussion on a subject with which all men of common sense are supposed to be competent to deal. In fact, some of the most famous writers on politics, such as, e.g., Locke and Rousseau, had no political or legal training whatever. In many cases great philosophers have aimed to give completeness to their general system of thought by constructing a part on political science, which is, however, in such cases usually composed merely of deductions from general theoretical principles.

The constitutional studies of Aristotle and the principles developed in his *Politics* form a sound basis for the science of the state; but, unfortunately, he had no successors to carry on the work in his spirit for almost 2000 years. During the Middle Ages Aristotle exercised a profound influence upon scholastic philosophy, which followed his doctrines very closely. Machiavelli took up the thread, and on the basis of a keen study of political facts, both in the records of Roman history and in the life of his own times, constructed his principles of practical politics. His work is founded upon actual observation, but like Adam Smith, he deals exclusively with certain definite human activities and characteristics to the exclusion of all others, and constructs for us the Political Man—animated solely by the will to gain political power. Jean Bodin lived in the thick of the religious struggles in France, and his work is a direct result of the need he felt for a definite

basis of authority in the shifting circumstances of his time. His theory of sovereignty may be called the portal of modern political science, because it first clearly focuses all political action in the sovereign and places the source of political power within the state itself; but the theory is primarily juristic and has given rise subsequently to many theoretical constructions which do not accurately express the forces of political life. Three of the great philosophers of the seventeenth century—Hobbes, Spinoza, and Locke—developed political theory as a part of their philosophical system; but, though starting from similar premises, they arrive at entirely different conclusions. The thought of their age was primarily mathematical, and their method is purely deductive, developing a system of political structure from a few principles assumed as axiomatic, in the manner of a theorem in geometry. The impulse which was given at this time to the mathematical sciences, and through them to the physical, led to an effort on the part of Montesquieu to explain the connection between political institutions and physical environment. Scientific in the sense of basing his results upon induction from facts, Montesquieu lacks the critical spirit of the Historical school and is often captivated by mere fanciful analogies. Burke has a scientific conception of politics in the sense of seeing in institutions a natural development and of basing his political principles upon a careful study of political experience; but he idealizes the past and looks upon the present rather with the eyes of the statesman who is defending certain forms of political life than in the spirit of the scientific investigator. Rousseau, Kant, and the entire Classical Liberal school are all given to a priori reasoning, taking as their starting point the rational individual, they endeavor to construct a system of government in which his independence may be preserved. The fact that Rousseau's theory has been made by varying interpretations the basis of liberalism, of democracy, and even of state socialism indicates the ease with which the deductive method may be used to produce any result desired.

In the nineteenth century a truly scientific method began to be applied to the study of political facts. Savigny, Maine, Ihering, Pollock, Maitland, and Judge Holmes have applied the historic method to institutional and legal facts. The careful observation and analysis of contemporary institutions has led to fruitful results in the works of De Tocqueville, Bagehot, Bluntschli, Woodrow Wilson, A. L. Lowell, and Ostro-gorski. Writers like Jellinek and Burgess, while juristic in their method, give careful attention to existing state forms. Cornwell Lewis combines the scientific method of observation with a highly philosophical spirit. Lately a school of political scientists has arisen who apply to their writings the term "sociological." They hold that the true study of politics should rest, not upon the legal analysis of institutions, but upon an investigation of the forces of society that are striving to express themselves through political action. They emphasize particularly the existence of groups within the state that represent common interests and are animated by common motives, and they conceive of state life as made up of the struggle and competition between these social groups. The principal representatives of this theory are the Austrians Gumplowicz and Ratzenhofen.

The inductive method, based upon observation and the study of recorded facts, is, however, not the only one employed by eminent writers on politics during the nineteenth century. Hegel's purely philosophical construction of the state finds an echo in the writings of T. H. Green and of Bosanquet. The deductive method is used by Sidgwick, Lieber, Mill, and the Liberal school in general. The juristic method of analyzing existing institutions is still almost universally in the ascendant in books dealing with jurisprudence and constitutional law. The works of American constitutional jurists are primarily analytical, and although they devote considerable attention to the history of the formation of the Constitution, this is done in order more fully to explain that instrument, which is then analyzed and examined in all its bearings upon modern government. English jurists like Holland, Anson, and Dicey still employ this method with preference, although the historic study of law has made great progress in England. See CIVIL ADMINISTRATION; CONSTITUTIONAL LAW; DIPLOMACY; GOVERNMENT; INTERNATIONAL LAW; SOCIOLOGY; STATE.

Bibliography. Sir G. C. Lewis, *A Treatise on the Methods of Observation and Reasoning in Politics* (2 vols., London, 1852); Rudolf Gneist, *Der Rechtsstaat* (Berlin, 1872); J. K. Bluntschli, *Theory of the State*, English translation (Oxford, 1892); Théophile Funck-Brentano, *La politique* (Paris, 1892); Gustav Ratzenhofer, *Wesen und Zweck der Politik* (3 vols., Leipzig, 1893); Sir J. R. Seeley, *Introduction to Political Science* (New York, 1896); W. W. Willoughby, *Examination of the Nature of the State* (ib., 1896); Ludwig Gumplowicz, *Allgemeine Staatsrecht* (Innsbruck, 1897); Henry Sidgwick, *Elements of Politics* (New York, 1897); Bernard Bosanquet, *Philosophical Theory of the State* (ib., 1899); Sir Frederick Pollock, *Introduction to the History of the Science of Politics* (London, 1900); Bryce, *Studies in History and Jurisprudence* (2 vols., New York, 1901); W. A. Dunning, *History of Political Theories* (2 vols., ib., 1902-05); C. E. Merriam, *History of American Political Theories* (ib., 1910); J. N. Figgis, *Studies of Political Thought from Gerson to Grocius, 1414-1465* (Cambridge, 1907); Miemeke, *Weltburgertum und Nationalstaat* (Munich, 1911); Georg Jellinek, *The Rights of Minorities*, English translation by A. M. and T. Baty (London, 1912); R. G. Gettell, *Problems in Political Evolution* (Boston, 1914); C. D. Burns, *Political Ideals: Their Nature and Development* (Oxford, 1915); W. J. Brown, *Underlying Principles of Modern Legislation* (New York, 1915); R. B. E. Hammond, *Bodies Politic and their Governments* (ib., 1915); N. S. Shaler, *The Citizen: Study of the Individual and the Government* (Boston, 1915). Encyclopædias, etc.: Josef Stammhammer, *Bibliographie der Social-Politik* (2 vols., Jena, 1896-1912); J. J. Lalor, *Cyclopædia of Political Science* (3 vols., New York, 1904); *Bibliographie der Sozialwissenschaften* (Dresden, 1906, annually); Ludwig Elster, *Wörterbuch der Volkswirtschaft* (3d ed., 2 vols., Jena, 1911); McLaughlin and Hart, *Cyclopedia of American Government* (3 vols., New York, 1914).

POLITICAL SECRET SOCIETIES. See SECRET SOCIETIES

POLITICS, THE. A work by Aristotle discussing the relation of man to the state and the different forms of government, and presenting an

ideal state incorporating the best points of various systems.

POLITIQUES, pò'lè'ték' (Fr., politicals). The name of a party which arose in France in the reign of Charles IX, composed of moderate Catholics and Protestants, and aiming at the termination of the civil strife by a compromise between the two factions on the basis of religious toleration and the preservation of the rights of the state as against the privileges of sectaries. It was influential in establishing Henry IV on the throne. See FRANCE.

POLITY (Gk. *πολιτεία*, *politeia*, polity, citizenship). A term used to describe the system on which a state or a church is organized as a structural unity. In civil usage the principal forms of polity are monarchy, the rule of one man; aristocracy, the rule of the best; democracy, the rule of the people as a whole; oligarchy, the rule of a few. In ecclesiastical organization the principal forms are the papal, in which supreme government is placed in the hands of the Pope alone; the episcopal, in which it is shared by the whole body of bishops; the presbyterian, where it is held by an assembly of presbyters; and the congregational, in which each congregation is independent of any central government.

POLITZER, ADAM (1835-). An Austrian aurist. He was born at Alberti, Hungary, studied in Vienna, Würzburg, Paris, and London, in 1861 became lecturer at the University of Vienna, and in 1894 professor of otology. He had achieved great success in 1863 with the publication of his method of treating deafness consequent on catarrh of the inner ear, and he gathered at Vienna a wonderful collection for the anatomical and pathological study of the ear. The more important works of Politzer are: *Beleuchtungsbilder des Trommelfells* (1865); *Lehrbuch der Ohrenheilkunde* (1878-82; 5th ed., 1908); *Die anatomische und histologische Zergliederung des menschlichen Gehörorgans* (1889); an *Atlas der Beleuchtungsbilder des Trommelfells* (1895); while his *Geschichte der Ohrenheilkunde* (2 vols., 1907-13) is a standard work.

POLIXENES, pò-lik's-è-néz. The King of Bohemia, in Shakespeare's *A Winter's Tale*, whom Leontes attempts to poison.

POLIZIANO, pò-lèt-sè-à'nò, ANGELO (Latinized form, *Politianus*) (1454-1494). An Italian scholar and poet. He was the son of a doctor of civil law and was born at Montepulciano in Tuscany. The family name was Ambrogini, but Poliziano took his name from that of his native town—in Latin, Mons Politianus. He studied Latin at Florence under Cristoforo Landia, Greek under Andronicus of Thessalonica, the Platonic philosophy under Marsilio Ficino, and the Aristotelian philosophy under Argyropoulos. When barely 15 years of age he published a poem of 1400 lines in honor of Giulio de' Medici, who had carried off the palm at a tournament. Lorenzo de' Medici took notice of the brilliant lad and, to afford him the means of continuing his studies, appointed him tutor to his two sons and subsequently gave him a residence in his charming villa near Fiesole, a few miles east of Florence, where Poliziano, who was passionately fond of country life, resumed his studies with fresh ardor. In 1484 he accompanied the Florentine ambassadors to Rome and was received in a flattering manner by the Pope, at whose request he translated into Latin

the Greek historian Herodianus, for which he received 200 gold crowns. He made also Latin versions of the *Enchiridion* of Epictetus (q.v.), the *Charmides* of Plato, and other works, with such elegance that Erasmus pronounced him a master in translation. After filling for some years a chair of Latin literature in Florence, he began the teaching of Greek. His popularity was so great that pupils came to study under him from all the great cities of Italy and even from distant parts of Europe; of these the more notable were Francesco Pucci, Fortiguerra, Maffei da Volterra, Grocyn, Thomas Linacre, and Michelangelo. In 1489 appeared his *Miscellanea*, a collection of critical and other observations on the ancient authors. Towards the close of his life he entered into orders and was made canon of the cathedral of Florence. Among the brilliant scholars of the Italian Renaissance Poliziano occupies a foremost place in virtue of his vigor and originality. While he admired the chaste and noble literature of antiquity, there was nothing servile in his imitations; he reproduced without difficulty the strength of

Tacitus, the elegance of Livy, and the conciseness of Sallust; his Latin poems, especially his elegies, display the beauty and ardor of his imagination. Among his vernacular pieces may be mentioned his *Canti carnascialeschi* (Carnival Ballads), remarkable for their felicity of style, sweetness of pathos, and abundance of imagery. Another proof of his varied poetical power was his *Orfeo*, one of the earliest dramatic compositions produced in Italy. For his life and works, consult the valuable book by F. O. Mencken (Leipzig, 1736); Carducci's edition of the Italian poems (Florence, 1863). Consult also: Gresswell, *Life of Politian* (London, 1805); Serassi, *Vita di Angelo Poliziano* (Milan, 1808); Norbert Bonafous, *De Angeli Politiani Vita et Operibus* (Paris, 1846); W. Roscoe, *Life of Lorenzo de' Medici* (10th ed., London, 1851); J. A. Symonds, *The Renaissance in Italy* (ib., 1875-86); id., *Sketches and Studies in Italy* (ib., 1879); J. E. Sandys, *Harvard Lectures on the Revival of Learning* (Cambridge, 1905); id., *A History of Classical Scholarship*, vol. ii (ib., 1908).

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